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MARINE TRAFFIC DATA OF MOBILE, ALABAMA

J.J. Cherny III, D.E. Watson, R.A. Silva, B.H. Charters, and M.R. Young
U. S. Coast Guard Research and Development Center
Avery Point, Groton, Connecticut 06340

May 1978

Final Report

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D. L. Birkimer

DONALD L. BIRKIMER, Ph.D., P.E.
Technical Director
U.S. Coast Guard Research and Development Center
Avery Point, Groton, Connecticut 06340

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16. Abstract

Data was collected on the marine traffic and VHF-FM marine communications channel usage at Mobile, Alabama, during the period of 23-30 January 1978. The marine traffic data was recorded by means of time-lapse photography of a radar display. Recordings were made of the communications on VHF-FM maritime mobile Channels 13 and 16 as received at the site.

The daily average of marine traffic, including large, medium, small and anchored vessels, and tugs-in-tow, transiting the main ship channel and Intracoastal Waterway is 95.

Approximately 150 hours of communications on VHF-FM Channels 13 and 16 were recorded and monitored to determine channel efficiency (i.e., percentage of valid messages) and utilization. Channel 13 efficiency is 61.35%, utilization 2.46%. Channel 16 efficiency is 43.18%, utilization 5.86%.

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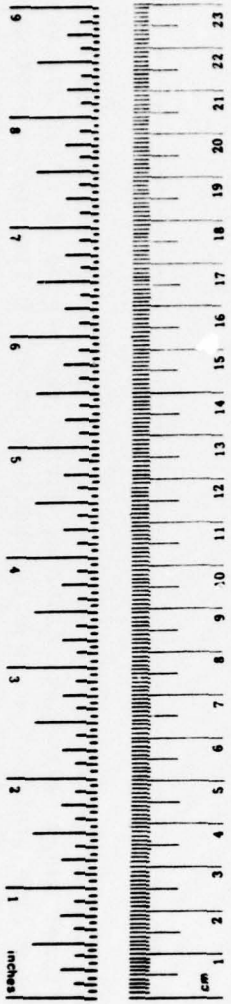
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

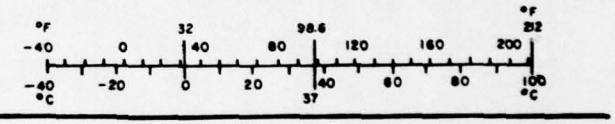
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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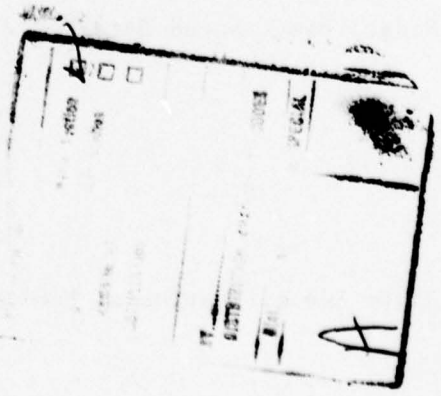

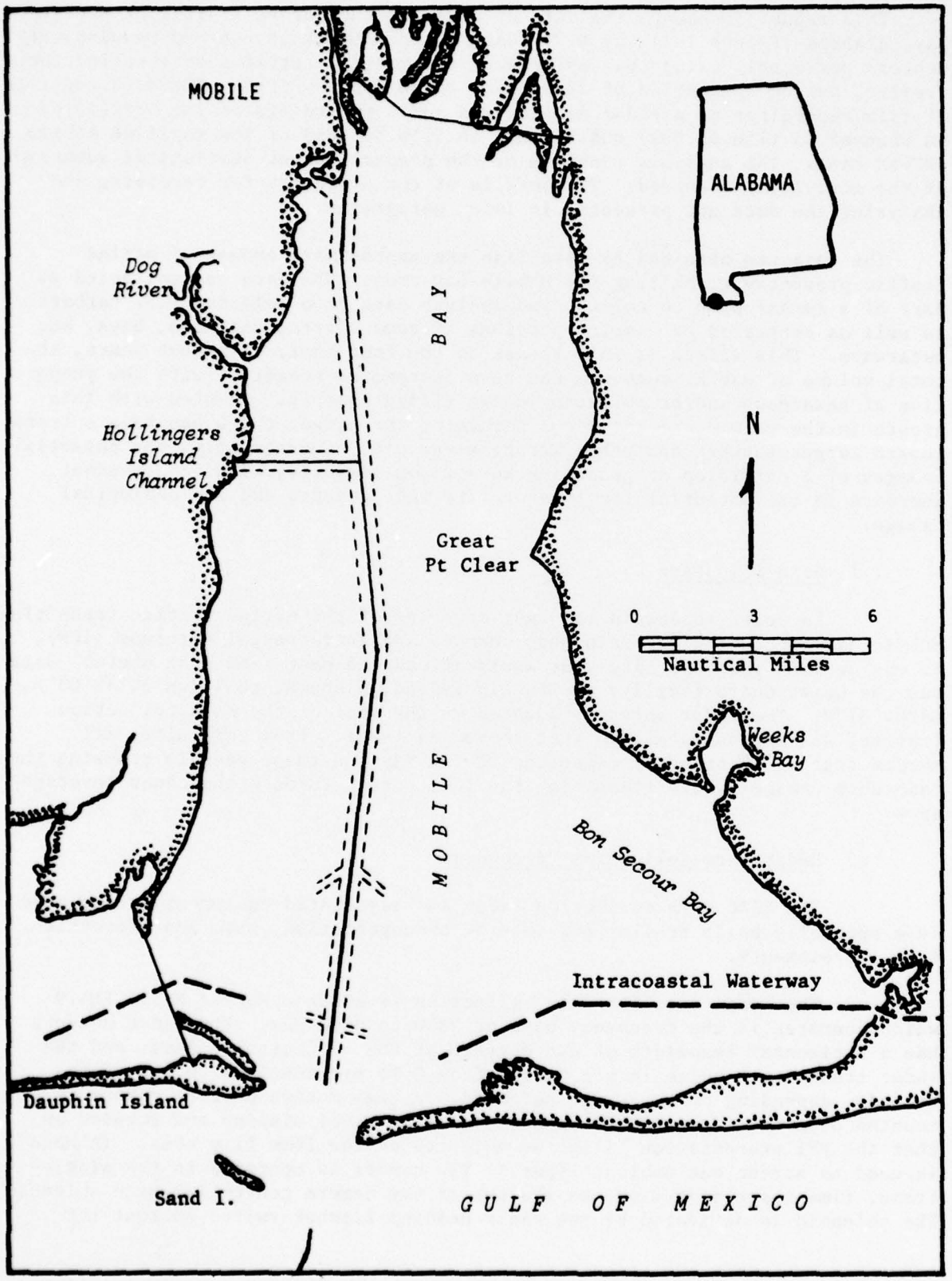

FIGURE 1-1: MOBILE BAY, ALABAMA

1.0 INTRODUCTION

This report documents the data obtained on the marine traffic at Mobile Bay, Alabama (Figure 1-1), by U.S. Coast Guard R&DC (Research and Development Center) personnel, using the Center's vessel traffic services data collection trailer, during the period of 23 January to 30 January 1978. The data consists of film recordings of a radar display and audio recordings of the activities on Channel 13 (156.65 MHz) and Channel 16 (156.80 MHz) of the maritime mobile VHF-FM band. The analysis consists of the preparation of statistical summaries of the activities recorded. The details of the procedure for recording and analyzing the data are presented in later paragraphs.

The data was obtained to establish the approximate amount of marine traffic presently transiting the Mobile Bay area. The data was collected as part of a larger plan to collect and analyze data from selected U.S. harbors as well as congested or complex portions of some rivers, channels, bays, and waterways. This effort is in response to the fact that, in recent years, the total volume of marine commerce has been increasing steadily, with the proportion of hazardous and/or polluting cargo rising sharply. Coupled with this growth in the volume and hazardous nature of the cargo, there has been a trend toward larger tankers and other merchant vessels. Consequently, the potential damages of a collision or grounding have risen steadily, with an attendant increase in the potential for loss of life and property and for ecological damage.

1.1 Site Selection

In order to obtain the best coverage of the marine traffic transiting Mobile Bay, including the main ship channel and Intracoastal Waterway (ICW), it was decided that the site that would afford the most (and most useful) data was the Coast Guard facility at Dauphin Island, Alabama, position 30°15'03"N, 88"04'37"W. The radar antenna, mounted on the roof of the data collection trailer, was approximately 20 feet above sea level. From this site, all marine traffic entering or departing Mobile Bay and those vessels crossing the main ship channel while transiting the ICW, passed through the radar coverage area.

1.2 Radar Data Collection Procedures

The R&DC data collection radar and associated equipment are mounted in a specially built trailer for ease of transportation, use, and protection from the elements.

The radar used for data collection is a Decca Marine Model RM429 which operates in the frequency band of 9380 to 9440 MHz. The radar antenna has a horizontal beamwidth of 0.8 degrees at the -3 decibel points, and the radar transmitter pulse length varies from 0.05 microseconds to 1.2 microseconds, depending on the range selected. A 16mm motion picture camera is mounted over the radar PPI (Plan Position Indicator) display and focused so that the PPI presentation fills the majority of the 16mm film area. (A hood is used to screen out ambient light.) The camera is operated in the single-frame, time-lapse mode with the shutter of the camera controlled by a solenoid. The solenoid is activated by the radar heading flasher switch so that the

shutter is held open for one complete revolution of the radar antenna, then closed for the second revolution, open for the third revolution, and so on. As a result of this procedure, the film consists of "snapshots" of the entire sweep of the radar, which is pleasing to the eye and easier to interpret than a conventional motion picture.

Mounted above and below the PPI display, and within the field of view of the camera, are small, alpha-numeric display panels. Auxiliary circuitry is used to display, on these panels, the date and time and geographic name of the radar site. As a result, each frame of the 16mm film contains the time it was exposed and the location of the radar at that time. This information simplifies the task of determining vessel speeds or the time an observed event occurred.

The radar has the capability of orienting the PPI display in any direction. The display is set up with true north at the top of the 16mm film frame when viewed so that the alpha-numeric characters are properly oriented. However, due to various limitations, the orientation of the film image with respect to true north is only accurate to +/- 5 degrees.

The radar has also the capability of offsetting the antenna location from the center of the PPI display. This capability allows the PPI display to be oriented so that a particular area of interest fills a greater portion of the 16mm film frame than would otherwise be possible.

Although the radar is equipped with the usual heading flasher, fixed and variable range rings, and bearing cursor, they are usually suppressed and do not appear on the film imagery.

After the radar data collection trailer is located at a given site, tested, and adjusted, data is usually recorded on a 24-hour-a-day basis for seven days with a frame of film being exposed approximately every five seconds during this period. However, a few minutes of data are lost every five hours when the film is changed.

1.3 Communications Collection Procedures and Equipment

In addition to the radar system mentioned previously, the data collection trailer is equipped with VHF-FM receivers tuned to Channels 13 and 16 of the maritime mobile band. The audio output of these receivers and a time code are recorded on magnetic tape cassettes. The audio signal is also sent to an automated channel utilization recording system, described in the following paragraph. The purpose of these recording systems is to document the present utilization and efficiency of these channels, both of which are important to the safe and orderly movement of marine traffic. Channel 16 is used to alert others to a distress or emergency situation, or to establish initial communications with another station (ship). Channel 13 is used in inland waters by the bridge personnel of vessels in meeting, crossing, or overtaking situations, to agree on the action they are each to take to avoid collision.

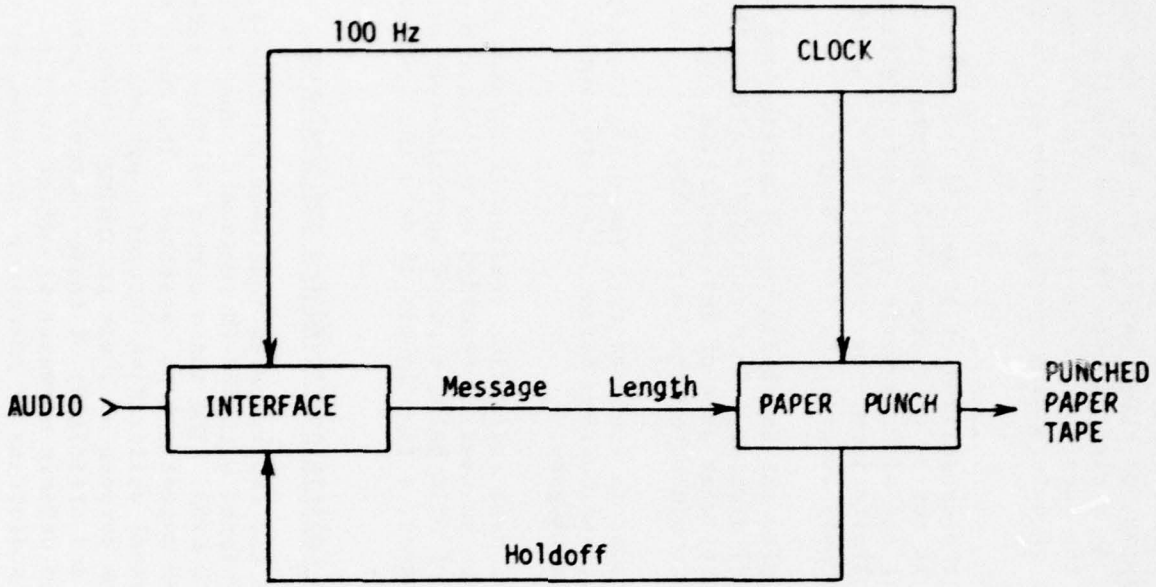

FIGURE 1-2: COMMUNICATIONS DATA COLLECTION

```
01.01 C INITIALIZE THE PROGRAM
01.02 C THIS IS VERY SIMILAR TO THE 'FOCAL-69' ROUTINE
01.05 O 0;O I;ASK "ENTER A ONE (1) IF YOU ARE AT A NEW SIGHT ",X,!!
01.07 I (X-1)1.10,,1.10;T "ENTER SIGHT NAME (MAX 40 CHARACTERS) END"
01.08 T " HEADER WITH A 'RETURN'"!!;F I=1,40;S SI(I)=FIN();I (SI(I)-141),1.09,
01.09 B;S SI(0)=I-1
01.10 T "ENTER DATE OF RUN AS 'DD-MMM-YY' AND TERMINATE WITH A RETURN"!
01.15 FOR I-1,40;S DA(I)=FIN();I (DA(I)-141,1.20,
01.20 B;S DA(0)=I-1;Z TIME,SH,PG,NT,TOTIME;F Z=1,21;Z A(Z)
01.22 A "ENTER THE CHANNEL TO BE DONE = ",CH,!!
01.24 T "THE HEADER IS: "!!
01.25 X FOUT(140);T !!;F I=1,,SI(0); X FOUT(SI(I))
01.26 T :35"VHF-FM CH",%2.00,CH
01.27 T :55;F I=1,DA(0);X FOUT(DA(I))
01.28 Y PG;T :70"PAGE"%1.00,PG,!!
01.30 A "ENTER A ZERO OR A RETURN IF ALL IS 'OK' ",X,!;I (X),1.35,;G
01.35 S TM=15;;Z PG
01.40 T "LOAD THE FIRST TAPE INTO THE READER.  TYPE ANY CHARACTER WHEN READY"!
01.45 O 0 LPT:;0 I HSR
01.50 D 1.25,1.26,1.27,1.28;T !"TRANSMISSION TIME HISTOGRAM",!!
01.60 T "PERIOD ENDING:    NUMBER OF XMSNS:       MINUTES:      "
01.61 T "  PERCENT:",!!

02.10 A X;I (FTRM()-154),2.15,;I (3999-X)4.05,4.05,3.05
02.15 O 0;O I;A "MORE DATA TO ENTER (1=YES) ",X,
02.20 I (X-1)2.25,,2.25;T !LOAD THE TAPE INTO THE READER"!;D 2.30;G 2.10
02.25 O R 0;S X=6401;G 4.05
02.30 O R 0;0 I HSR:

03.04 C HANDLE DATA
03.05 I (X-1000)3.06;S X-X-1000
03.06 I X-1),,3.10;Y SHORTONES;G 2.10
03.10 S TIME=TIME+(X/10),TOTIME=TOTIME+(X/10),X=FMIN((FITR(X*.199)+1,21)
03.20 Y A(X),NT,NR;G 2.10

04.04 C HANDLE TIME INFORMATION
04.05 I (X-4000-TM)2.10
04.15 T "   ",%6.00,TM,"          ",NT,"           ",%4.02,TIME/60
04.20 T "        ",%6.02,TIME/9,!
04.25 I ((TM/100)-FITR(TM/100)-.40)4.30; S TM=TM+40
04.30 S TM=TM+15;Z TI,NT;I (TM-1215),4.45,;I (TM-2400)4.05,,;I (X-6400)4.05,,;G 5.05
04.45 D 1.50,1.60,1.61;I (TM-2400)4.05,,;I (X-6400)4.05,,

05.04 C DATA SUMMARY
05.05 D 1.25,1.26,1.27,1.28
05.10 T !!,"TOTAL NUMBER OF TRANSMISSIONS"     ",%5.00,NR,!
05.15 T "AVE. NUM. OF TRANSMISSIONS PER HOUR: ",%4.01,NR/24,!
05.20 T "TOTAL TRANSMISSION TIME:
05.21 T %5.03,TOTIME/3600," HOURS",!
05.25 T "AVERAGE LENGTH OF TRANSMISSION:      ",%5.02,TO/NR," SEC.",!
05.30 T "PERCENT CHANNEL UTILIZATION:         ",TO/864,"%",!!!!
05.35 T "MESSAGE LENGTH HISTOGRAM",!!
05.40 T "LENGTH OF XMSNS      NUMBER OF XMSNS      PERCENT",!
05.45 S #=.4,F Z=1,1,20; D 6
05.50 T "LONGER THAN 10 SEC.:      ",%4.00,A(21),"           "
05.55 T %6.02,(A(21)/NR)*100,!!!!!!!!!!!!!!!
05.58 T "THERE WERE",%5.00,SH," XMSNS OF 00.1 AND 00.0 DURATION"!
05.60 O C;0 0;0 I;G

06.10 S TD=Z*.5; S PN=(A(Z)/NR)*100
06.15 T %3.01,TD-#," -",TD," SEC.     ",%6.00,A(Z),"           "
06.16 T %6.02,PN,!;S #=.5
```

FIGURE 1-3: COMPUTER PROGRAM TO ANALYZE RADIO COMMUNICATIONS DATA

DEFINITION OF VARIABLES FOR "VTS"

A(Z)	Length of transmission count for Message Length Histogram
DA(I)	Date of run, in special characters [DA(0)= number of characters in array]
CH	Channel being analyzed. Normally either 13 or 16
I	Loop counter used throughout program
NR	Total number of transmissions longer than 1 second
NT	Total number of transmissions in the 15 minute interval being analyzed. (Not including any of 00.1 duration)
PG	Page number
PN	Temporary variable used to establish percent of transmissions with specific message length
SI(I)	Sight Identification in special characters [SI(0)= number of characters in array]
SHORTONES	Transmissions having a coded duration of either 00.0 or 00.1. These DO NOT appear in 'NR'
TD	Temporary variable used to establish length of transmissions for Message Length Histograms
TIME	Total time of transmissions found in 15 minute interval being analyzed (Not including any of 00.1 duration)
TM	Upper limit of 15 minute interval being analyzed
TOTIME	Total time of all transmissions (Not including any of 00.1 duration)
X	Number read from data tape, dummy variable in "HANDLE DATA", and dummy variable throughout "INITIALIZE"

FIGURE 1-3 (continued)

The contents of the tape cassettes are manually monitored and a statistical summary of the appropriateness of the communications is compiled. In addition, histograms of message activity versus time of day and other statistics are compiled during representative periods by means of an automated channel utilization recording system. In this system, an interface circuit accepts an audio input from the receivers and timing data from a digital clock. The output of the interface circuit causes a punch to record on paper tape the time (received from the digital clock) and the message length of each transmission. A block diagram of the system appears in Figure 1-2. The paper tape is then processed in a mini-computer to generate histograms of the number of transmissions versus time of day and message length. The computer program appears in Figure 1-3.

The receiver squelch settings are adjusted to suppress most background noise bursts. Personnel monitor the receivers frequently during the data-punching process to ensure the system is operating properly and that the data is reasonable.

The tape recorder amplifier gain is reset as required to provide a proper signal to the remainder of the system. The speed of the tape recorders is checked by monitoring the IRIG-format time code recorded on the Channel 16 track of the tape recorder.

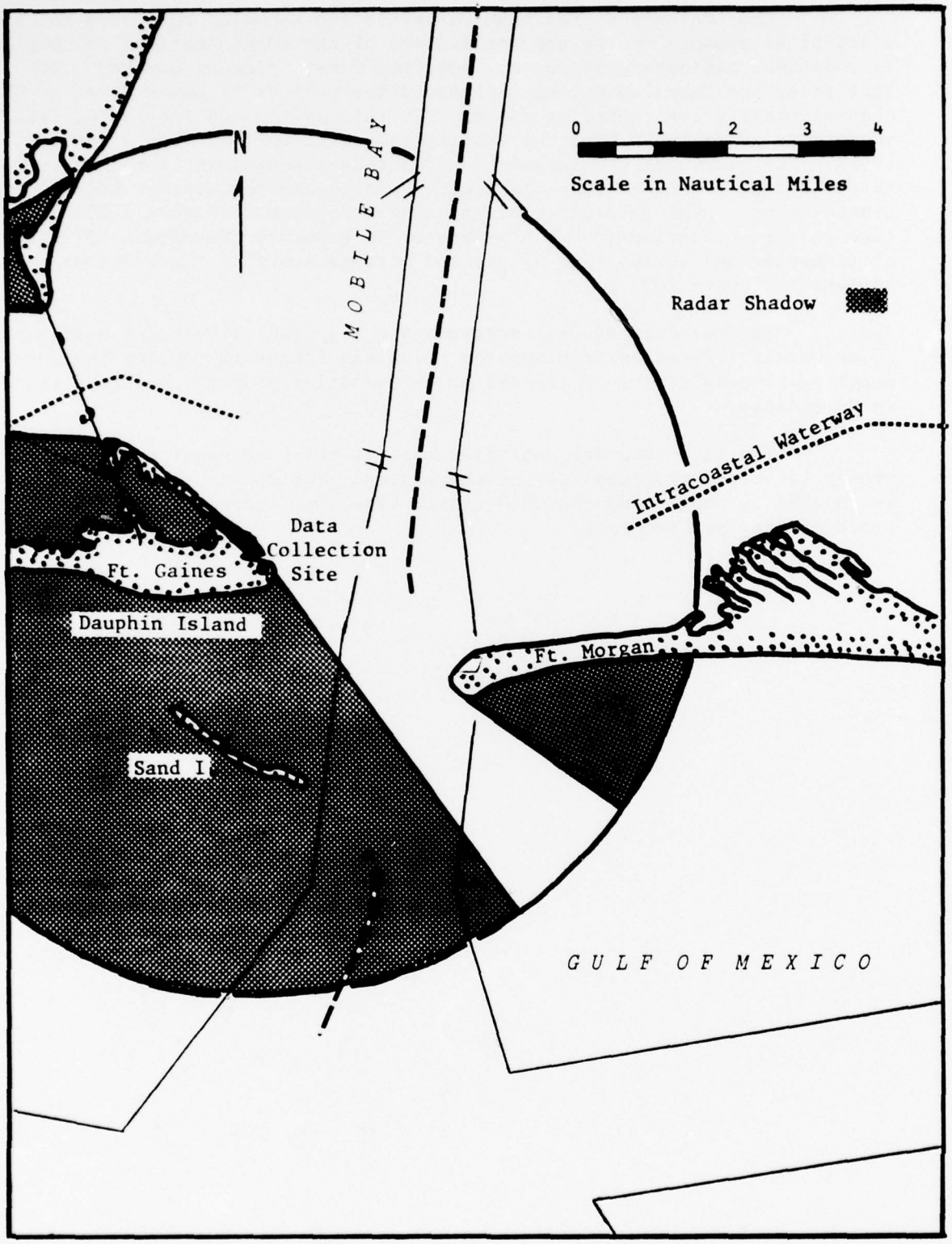

FIGURE 2-1: AREA OF RADAR COVERAGE

2.0 DISCUSSION OF DATA

The information contained in this chapter was collected at the Coast Guard facility, Dauphin Island, Alabama, during the period of 23-30 January 1978. The radar was operated on the six nautical mile scale during the data collection period. Figure 2-1 indicates the area of radar coverage.

2.1 Vessel Density

In general, the following information can be extracted from the time-lapse radar film:

1. Vessel density
2. Vessel speed
3. Destination
4. Anchorage locations
5. Closest point of approach (CPA) to other vessels
6. Number and time of occurrence of meeting situations
7. Number and time of occurrence of overtaking situations
8. Number and time of occurrence of crossing situations

The vessel density within the radar coverage area is presented in Figures 2-2 through 2-9. Vessel density is defined as the count of all vessels present within the radar coverage area taken at 15-minute intervals. The interval between counts was chosen to be equal to or less than the average vessel transit time through the radar coverage area. The vessels counted were classified by type and size, such as large (larger than 300 feet), medium, small (less than 100 feet), tug-in-tow, etc., determination of size being evaluated from the size relationship of the radar image. The "small" category includes fishing vessels, pleasure craft, and tugs that were not recognized as such. The data is presented as a histogram with time of day as the abscissa.

It is probable that some vessels identified as a medium or large vessel were actually a tug and barge(s), this identification not being distinguishable because of the vessel's distance from the radar.

The maximum number of simultaneous movements observed at Mobile Bay was 13, occurring at 1945 on Thursday, 26 January 1978, and at 1315 on Friday, 27 January 1978. This number represents the presence of 3 large, 5 medium, 4 small, and 1 anchored vessel on Thursday, and 9 medium, 3 small, and 1 anchored vessel on Friday.

The average of daily vessel transits is presented in Figure 2-10. To better present the traffic volume by area, the main ship channel and the ICW are each designated by letter, Section A being that part of the main ship channel south of the ICW; Section B is the main ship channel north of the ICW; Section C is that portion of the ICW west of the main ship channel; Section D is that portion of the ICW east of the main ship channel. The daily average per section is as follows:

VESSEL SIZE	SECTION A	SECTION B	SECTION C	SECTION D
Large	3	3	0	0
Medium	4	13	17	6
Small	12	9	11	13
Tug-in-tow	1	1	1	1

There were two overtaking and eleven meeting situations between medium or large vessels during the radar data collection period. The area near the Dauphin Island bridge was the site of the majority of the meeting situations.

An encounter between two medium or large vessels was deemed a "close encounter" if the distance between the vessels at their closest point of approach was less than 300 yards. There were no close encounters observed during the data collection period.

2.2 Vessel Speeds

The vessel speed data is based on the speeds of virtually all of the vessels imaged by the radar and is presented in Figures 2-11 through 2-18. A summary follows:

23 Jan - Monday	2.0 - 16.0 knots (7.9 knots average)
24 Jan - Tuesday	2.0 - 17.0 knots (8.5 knots average)
25 Jan - Wednesday	3.0 - 15.0 knots (8.3 knots average)
26 Jan - Thursday	4.0 - 23.0 knots (9.1 knots average)
27 Jan - Friday	2.0 - 24.0 knots (8.9 knots average)
28 Jan - Saturday	3.0 - 25.0 knots (8.5 knots average)
29 Jan - Sunday	4.0 - 25.0 knots (8.4 knots average)
30 Jan - Monday	2.0 - 15.0 knots (7.6 knots average)

Vessel speeds are determined by noting the distance in hundreds of yards that the vessel travels in three minutes, then applying the three-minute rule for speed, which states that the hundreds of yards a vessel travels in three minutes is its speed. Example, if a vessel travels 2,350 yards in three minutes, its speed is 23.5 knots.

All vessel speed data is dependent upon two factors: time and distance. The time component is held constant at three minutes and is measured by reading directly from the radar film. Since the individual frames are separated by at most five seconds, the error limit for each time measurement is, at most, +/- 1.4 percent. Also, in measuring the distance between two points, there is always the error associated with the smallest division of the ruler used. Additionally, the radar returns were not always distinct and symmetrical, thus measurement to the center of the return involves some estimation.

2.3 Route Identification

A route identification of the marine traffic transiting the main ship channel and ICW of Mobile Bay between 0000 and 1800 on Thursday,

26 January 1978, is presented in Figure 2-19. The tracks represent the transits of 6 large, 16 medium, and 11 small vessels. It is probable that the medium vessels tracked were actually tugs and tows, however, their indication on the radar did not identify them as such.

2.4 Communications Data Analysis

Approximately 150 hours of communications traffic from VHF-FM Channels 13 and 16 were recorded during the period of 23-30 January 1978. The receiving antennas were located at the forward part of the data collection trailer.

As mentioned previously, the recordings are monitored manually to prepare the histograms of message activity and channel efficiency for representative intervals during the period.

With respect to the Communications Message Activity histograms (Figures 2-20 through 2-35), a "valid" message is one that is appropriate for the channel that was used, such as the exchange of navigational or maneuvering information on Channel 13, and calls to initially establish communications on Channel 16. The "other" messages are those with squelch or indistinguishable transmissions, including those not spoken in the English language.

The Communications Channel Efficiency histograms (Figures 2-36 through 2-51) indicate the percentage of messages transmitted that were appropriate for the particular channel that was used.

Regarding the computer-prepared histograms for transmission time (Figures 2-52 through 2-55):

- Note that the figures in the column headed "PERIOD ENDING" are time intervals printed without the customary leading zeros. Thus, the time "0015" is shown as "15." The "MINUTES" column contains the total time occupied by transmissions during the period, while the "PERCENT" column indicates the percentage of the given period during which the channel was in use.

- It is probable that a number of the messages of less than 0.5 second in length are simply noise bursts. However, since it is common practice to acknowledge a transmission by briefly keying the transmitter (with no voice modulation), it did not seem desirable to ignore any usable signal. Thus, the figures for messages of less than 0.5 second should be used with caution.

The "number of messages" counts occasionally differ between the manually-reduced data and the machine-reduced data. This difference is apparently due to the machine detecting breaks in the signals being transmitted that were either not detected or were ignored by the personnel performing the manual analysis. The figures on duration of channel utilization obtained manually agreed well with those obtained by the automated equipment, indicating that the automated equipment is operating properly.

The channel efficiency (i.e., the percentage of valid messages) at Mobile is as follows:

CHANNEL 13	CHANNEL 16
61.35%	43.18%

The channel utilization exhibited the following peak and average values:

CHANNEL 13		CHANNEL 16	
PEAK	AVERAGE	PEAK	AVERAGE
42.12%	2.46%	20.43%	5.86%

2.5 Weather Data

Weather data, including the cloud coverage, wind direction and velocity, and visibility in nautical miles, is collected every hour, on the hour.

The following visibilities were recorded:

>6 nautical miles = 75%
4-6 nautical miles = 6%
1-3 nautical miles = 7%
<1 nautical mile = 12%

The greatest period in which visibilities were recorded at less than one nautical mile was between 0800 and 1630 on Tuesday, 24 January 1978 when visibility was reduced because of fog and heavy rainfall.

The winds recorded were from the northwest or southeast with the maximum velocity of 12 knots, having gusts in excess of 25 knots during the cyclone of 24 January.

Marine data is limited for Tuesday and Wednesday, 24-25 January 1978, because of weather interference being displayed on the radar PPI.

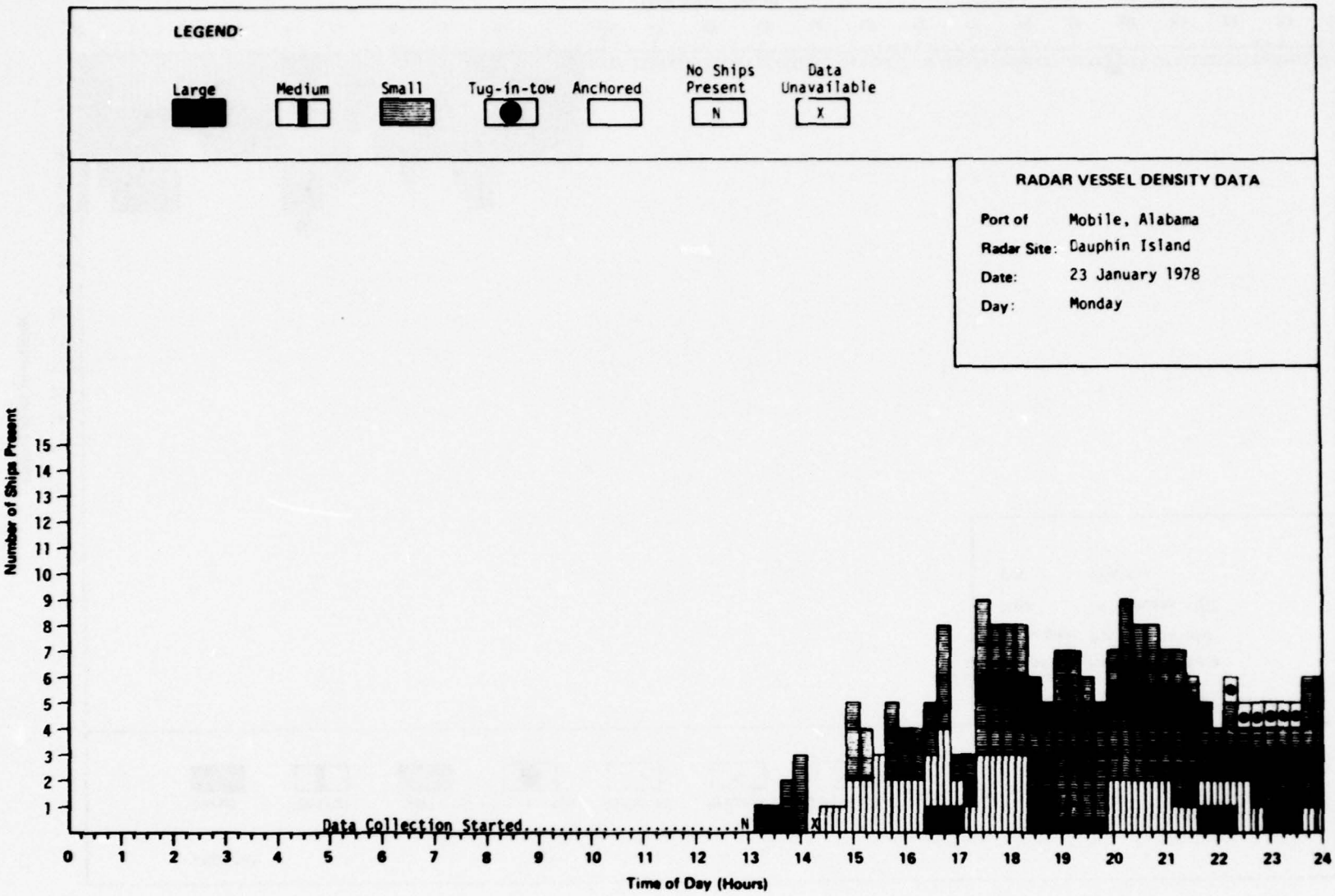
LEGEND
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 23 January 1978
Day: Monday
Number of Ships Present
Data Collection Started
N
X
Time of Day (Hours)

FIGURE 2-2

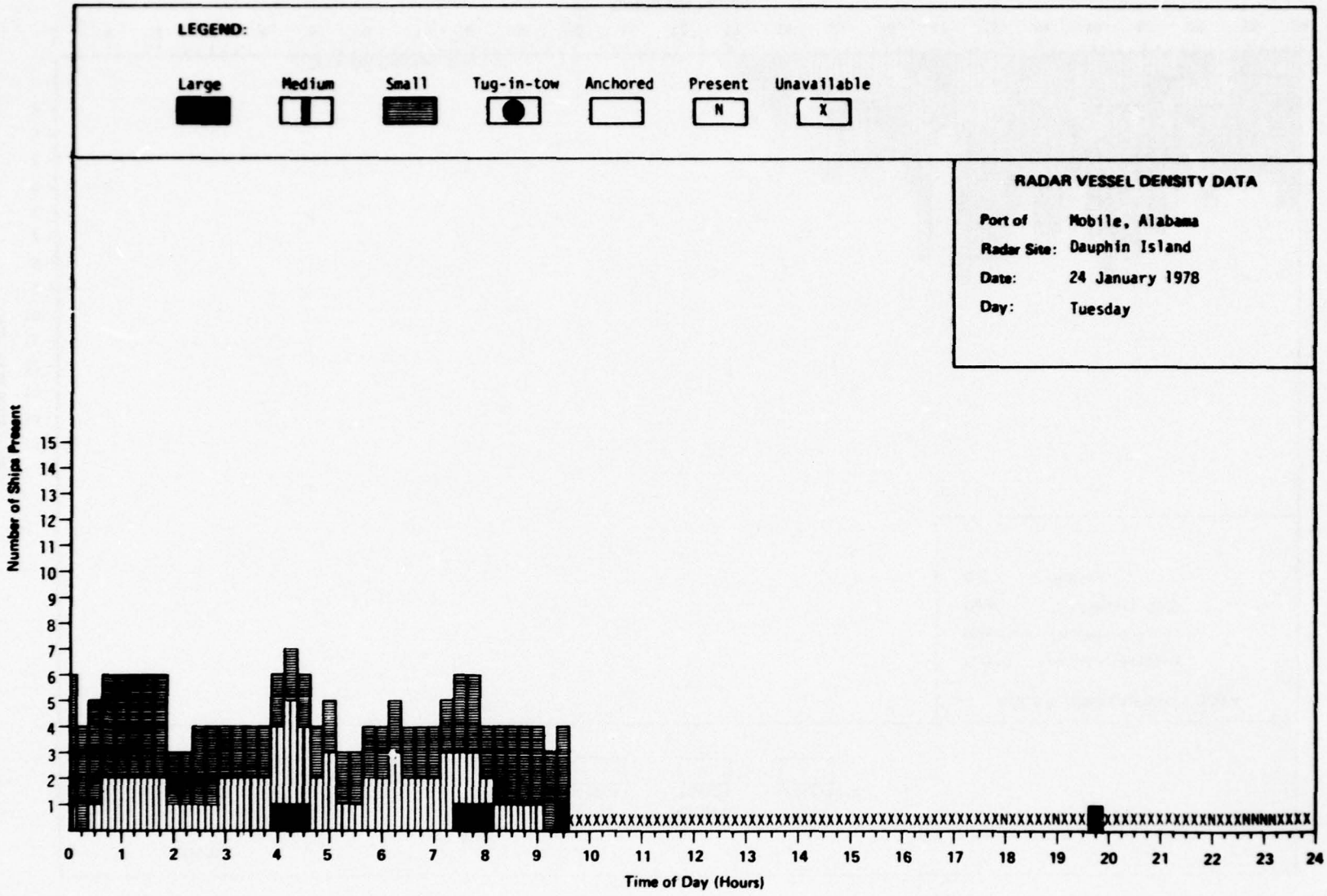
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
Present
N
Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 24 January 1978
Day: Tuesday
Number of Ships Present
Time of Day (Hours)

FIGURE 2-3

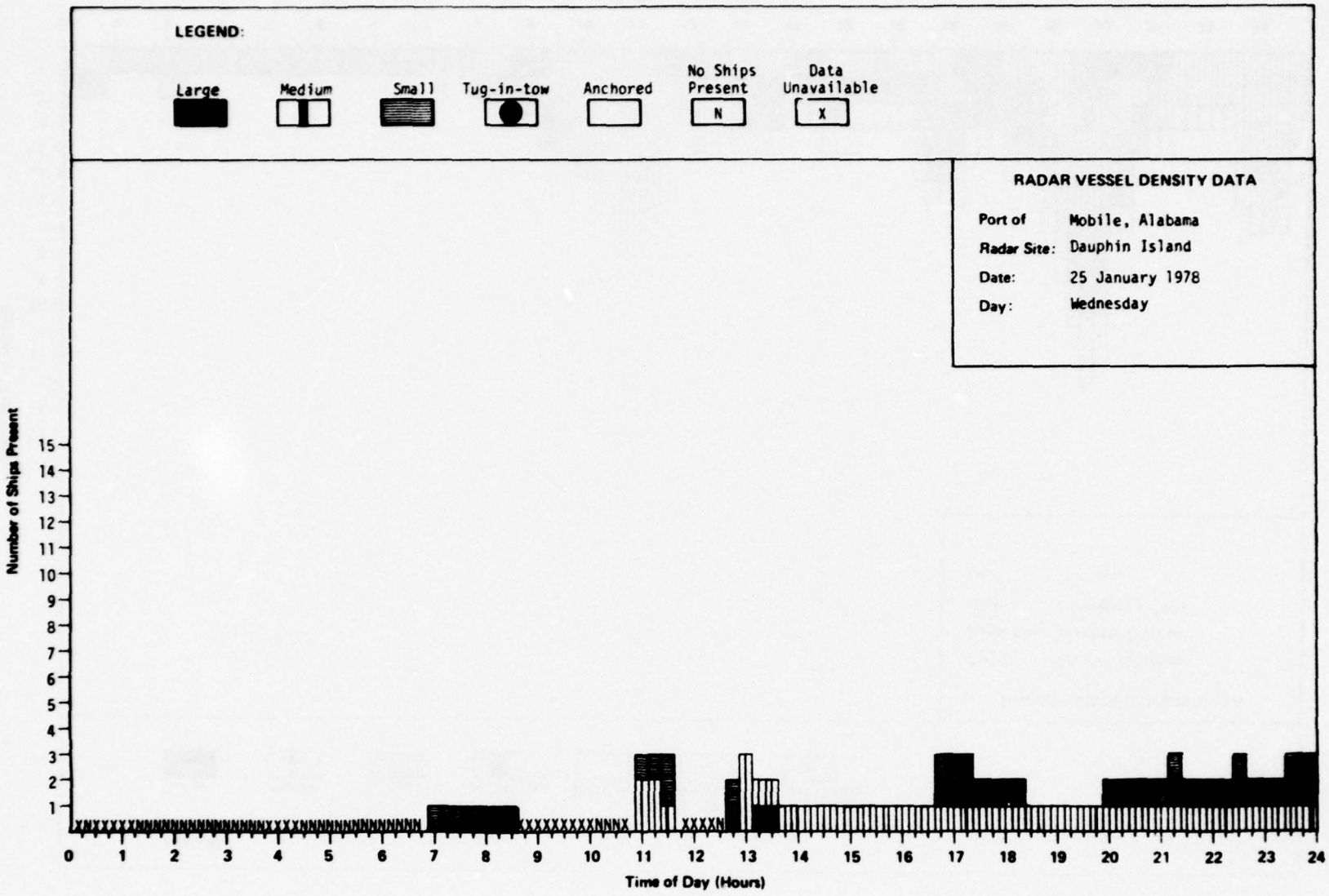
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 25 January 1978
Day: Wednesday
Number of Ships Present
Time of Day (Hours)

FIGURE 2-4

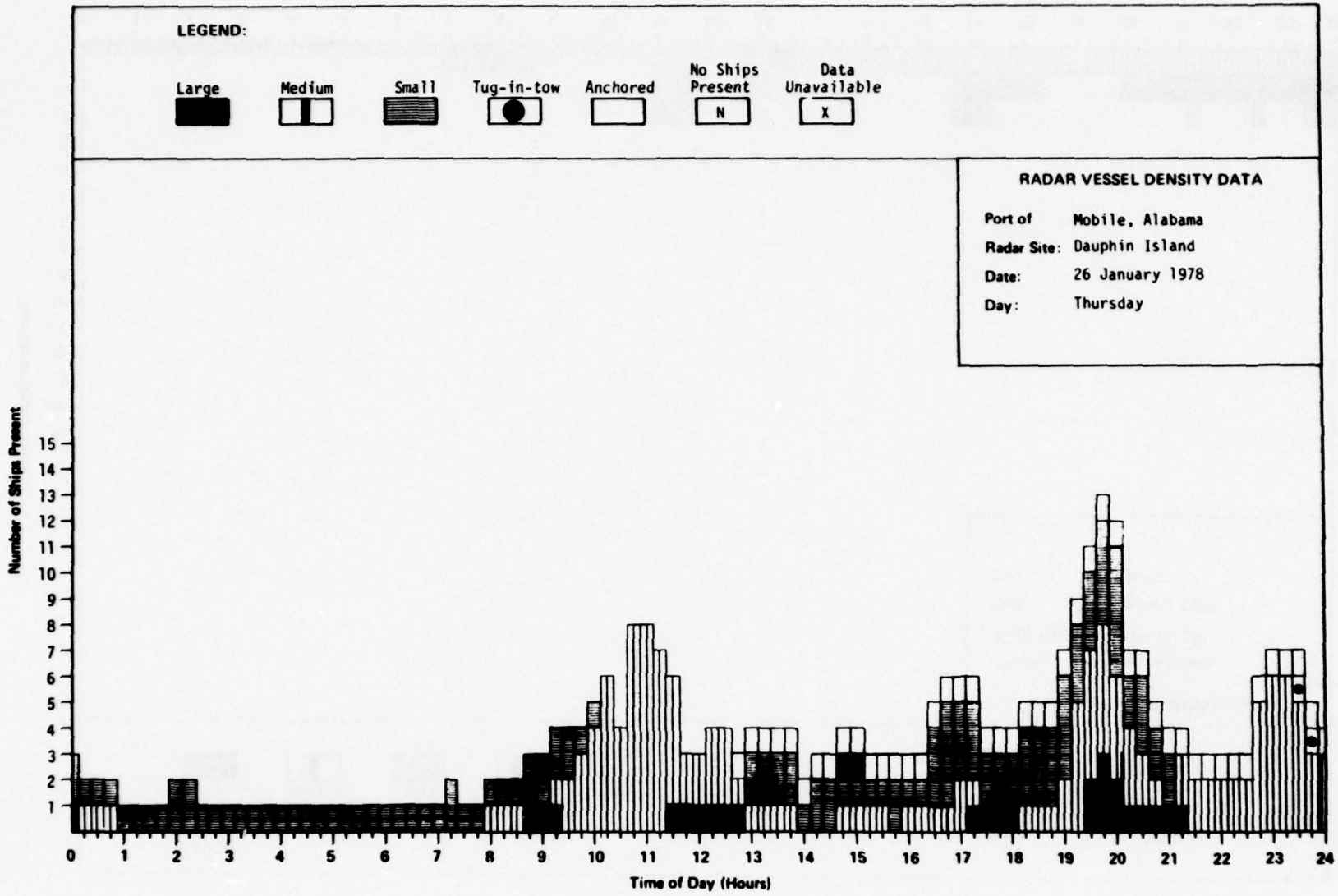
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 26 January 1978
Day: Thursday
Number of Ships Present
Time of Day (Hours)

FIGURE 2-5

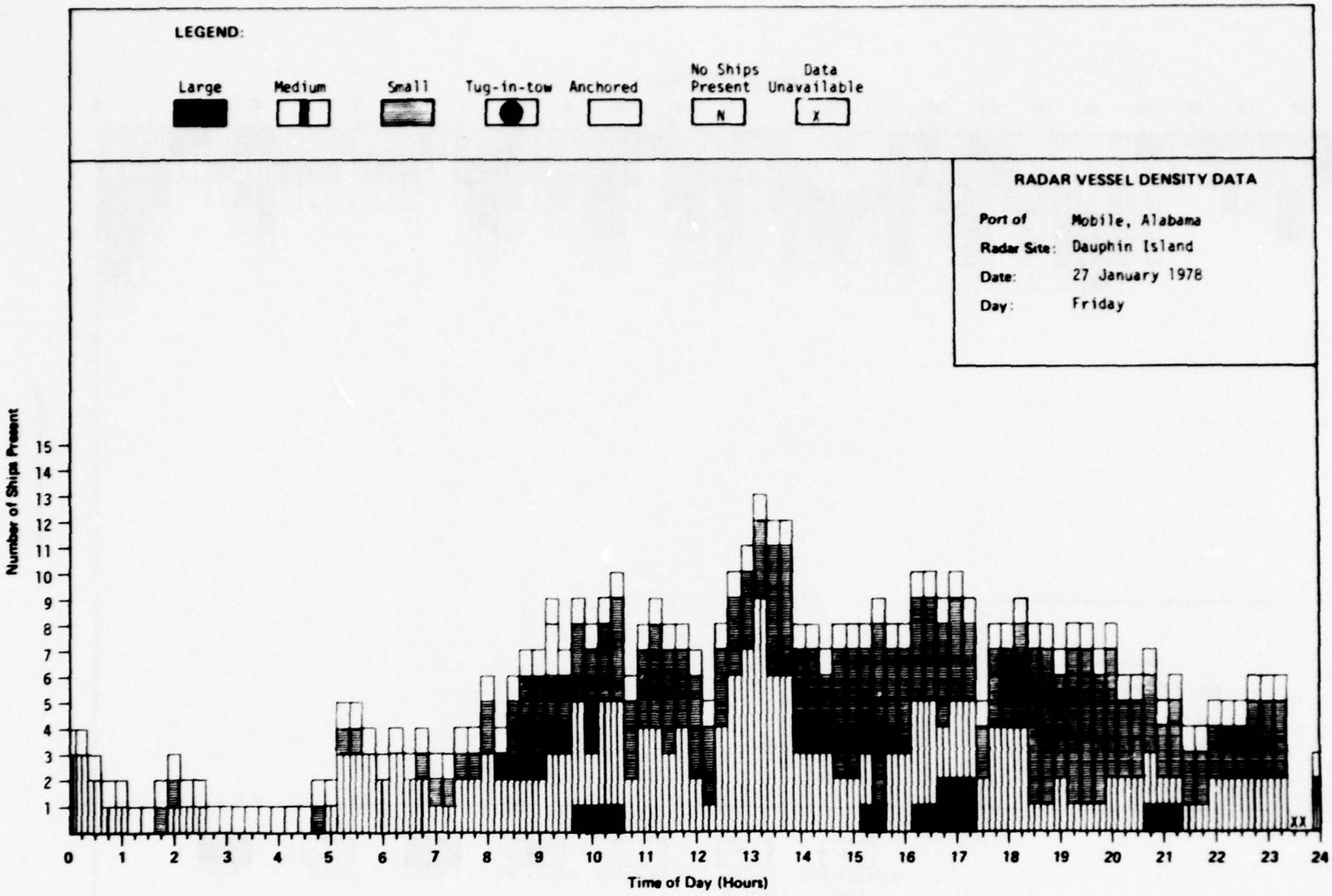
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 27 January 1978
Day: Friday
Number of Ships Present
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
XX
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Time of Day (Hours)

FIGURE 2-6

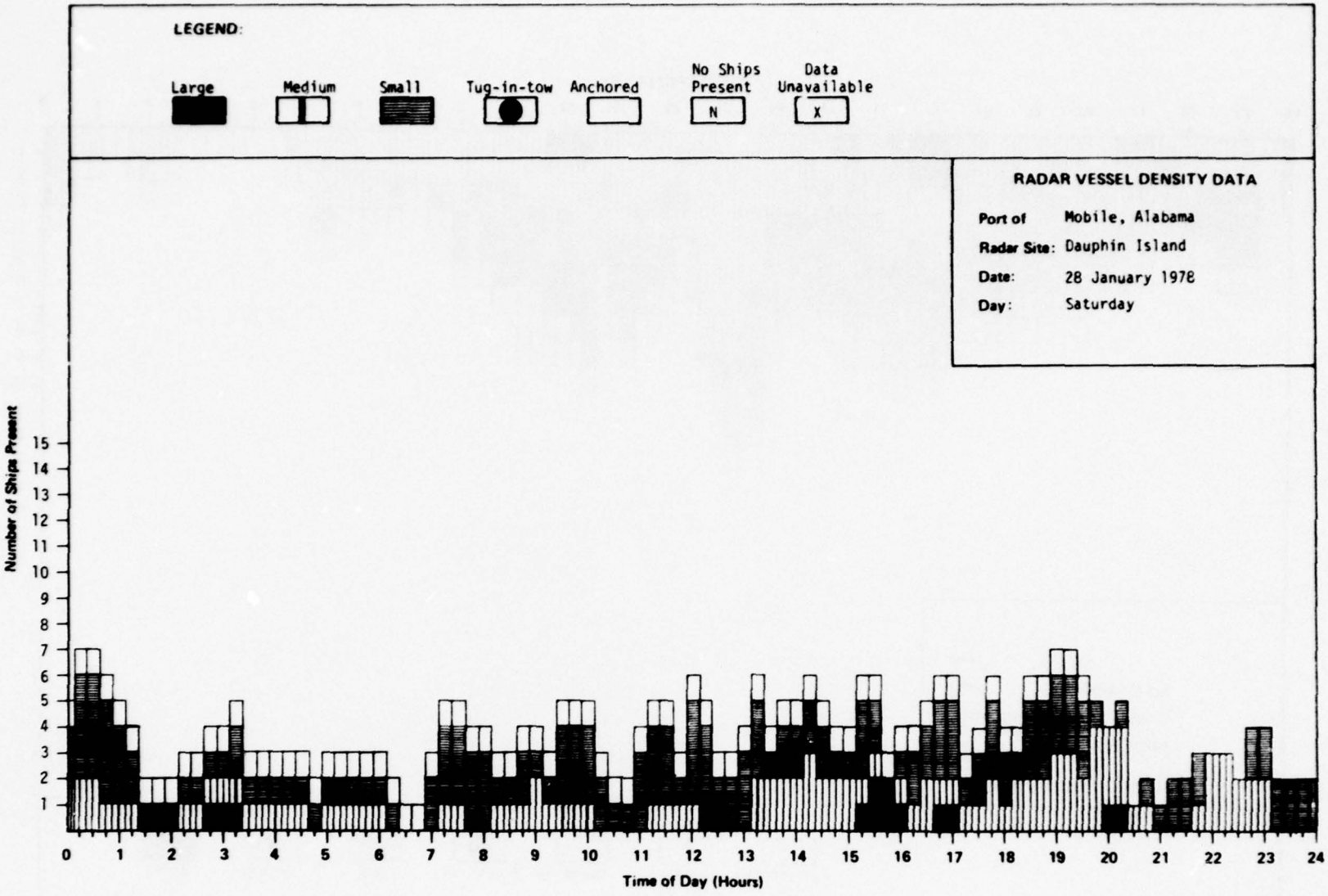
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 28 January 1978
Day: Saturday
Number of Ships Present
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Time of Day (Hours)

FIGURE 2-7

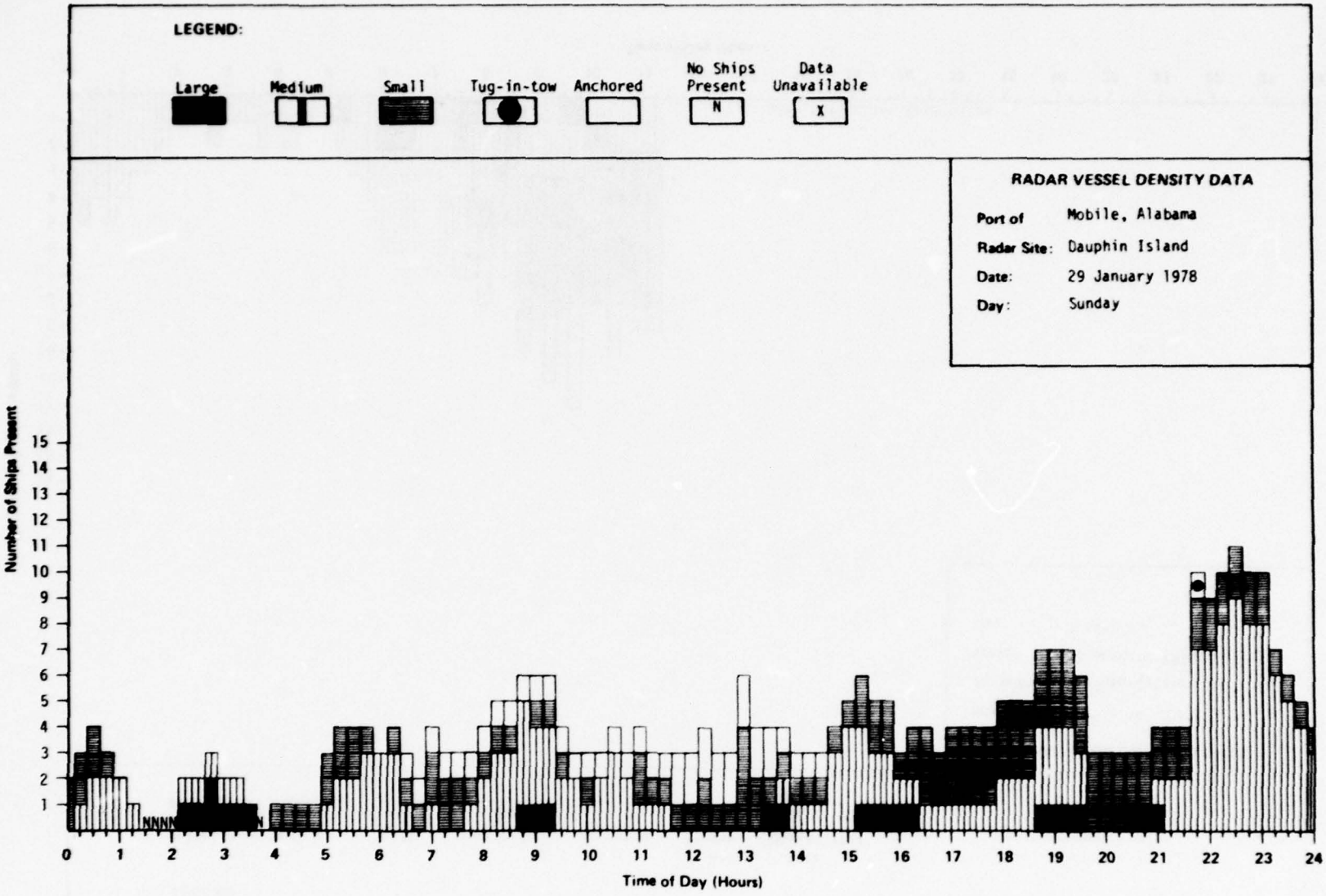
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 29 January 1978
Day: Sunday
Number of Ships Present
Time of Day (Hours)

FIGURE 2-8

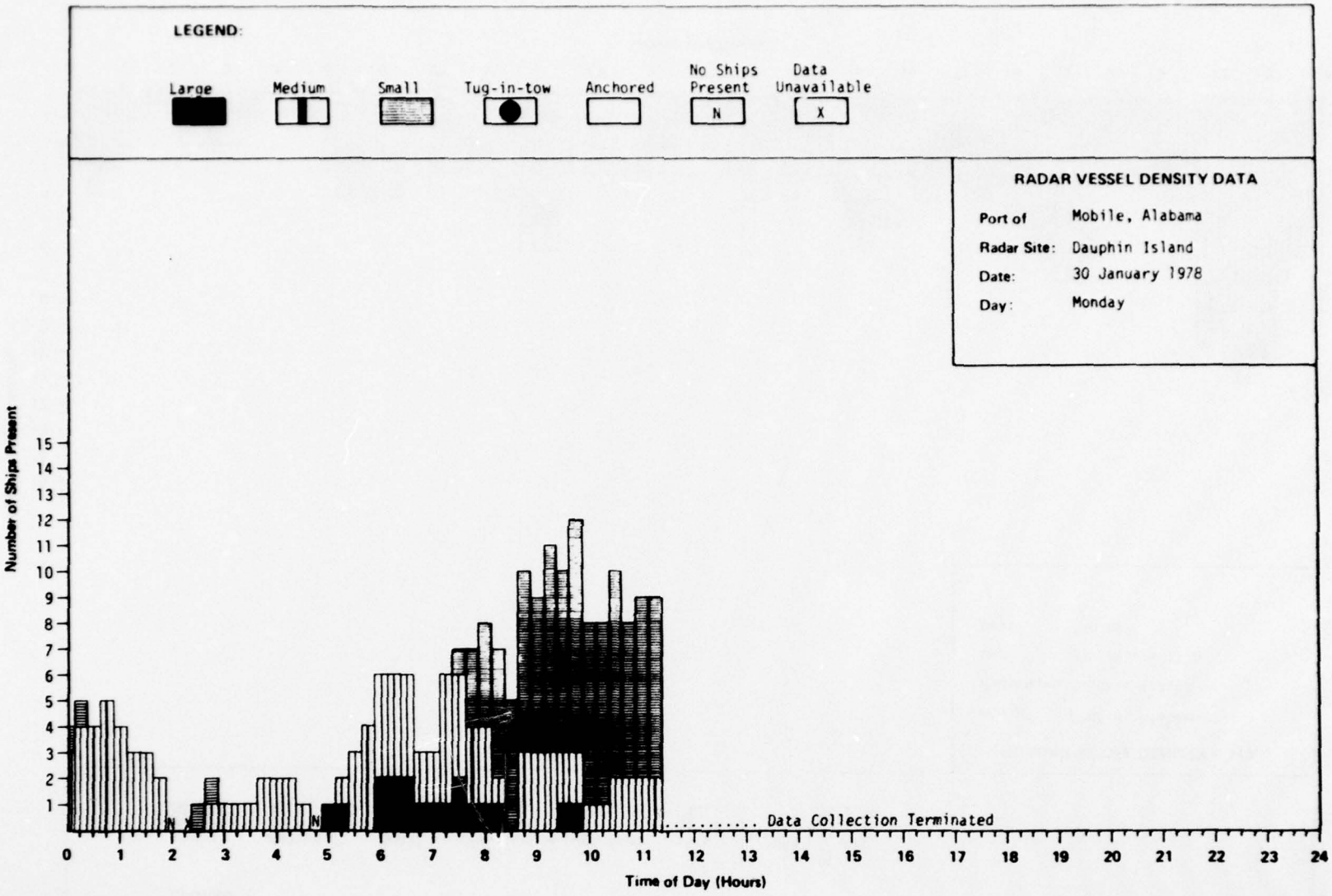
LEGEND:
Large
Medium
Small
Tug-in-tow
Anchored
No Ships Present
N
Data Unavailable
X
RADAR VESSEL DENSITY DATA
Port of Mobile, Alabama
Radar Site: Dauphin Island
Date: 30 January 1978
Day: Monday
Number of Ships Present
Time of Day (Hours)
Data Collection Terminated

FIGURE 2-9

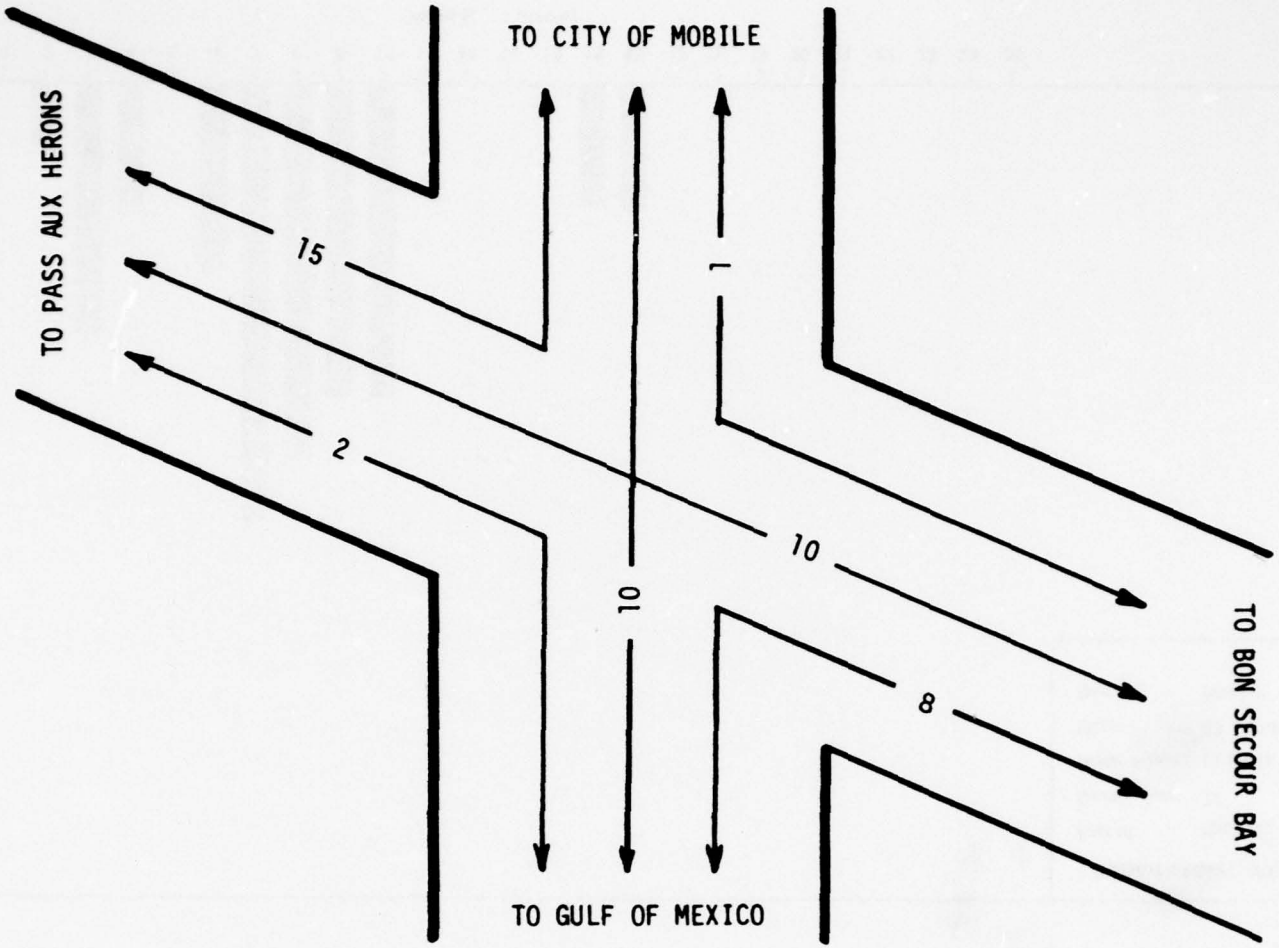

FIGURE 2-10: DAILY AVERAGE OF VESSEL TRANSITS

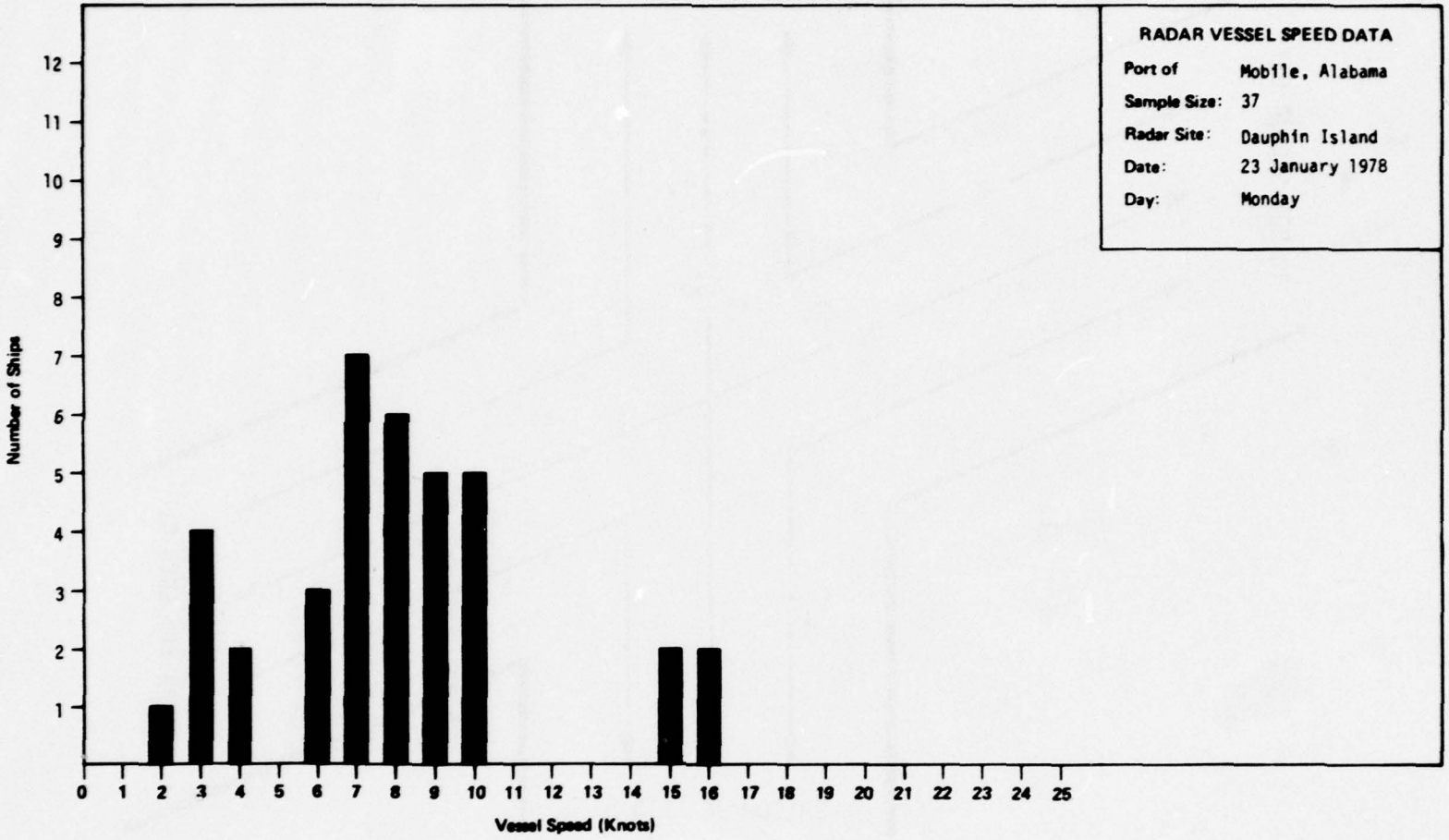
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 37
Radar Site: Dauphin Island
Date: 23 January 1978
Day: Monday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-11

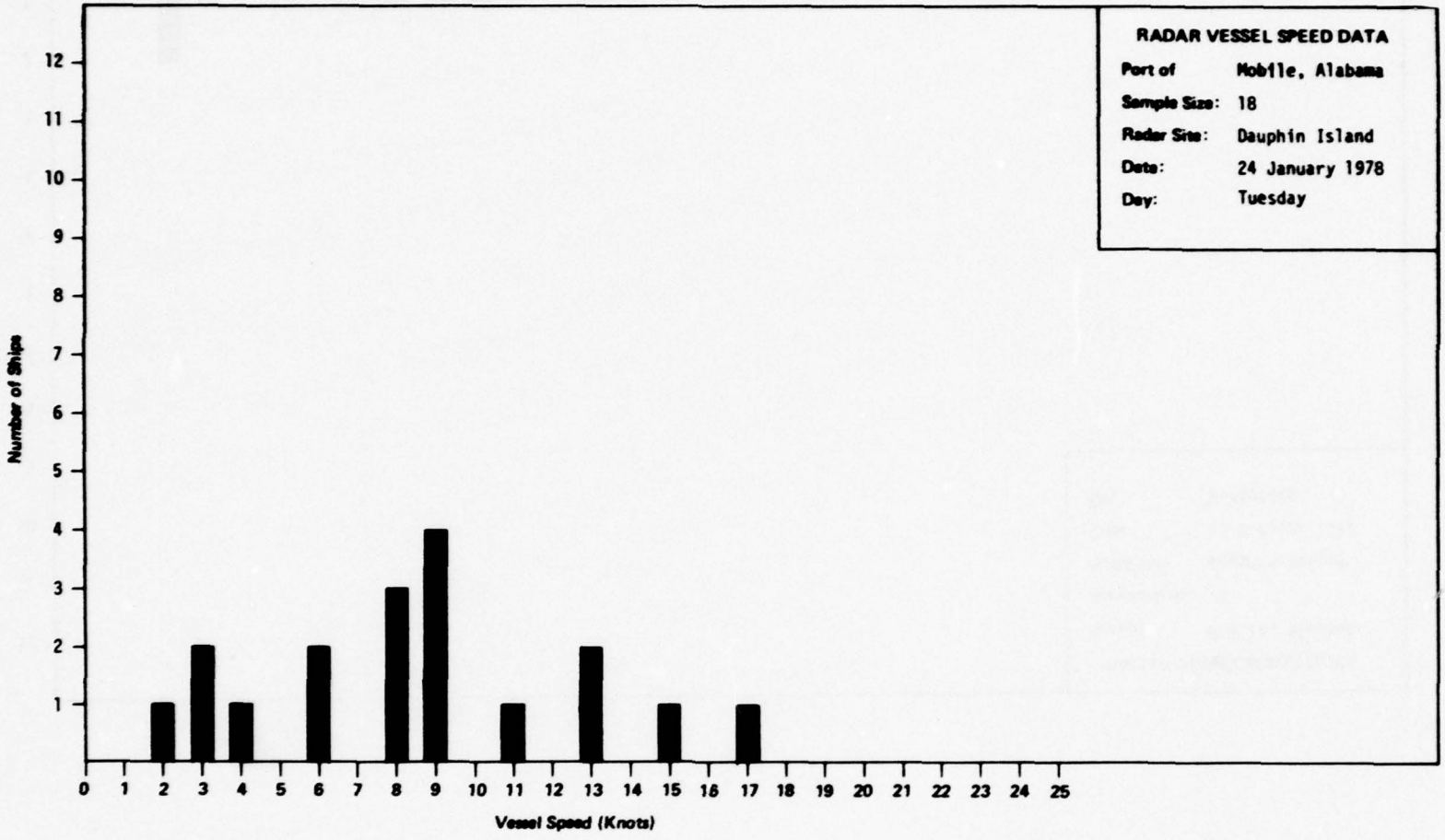
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 18
Radar Site: Dauphin Island
Date: 24 January 1978
Day: Tuesday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-12

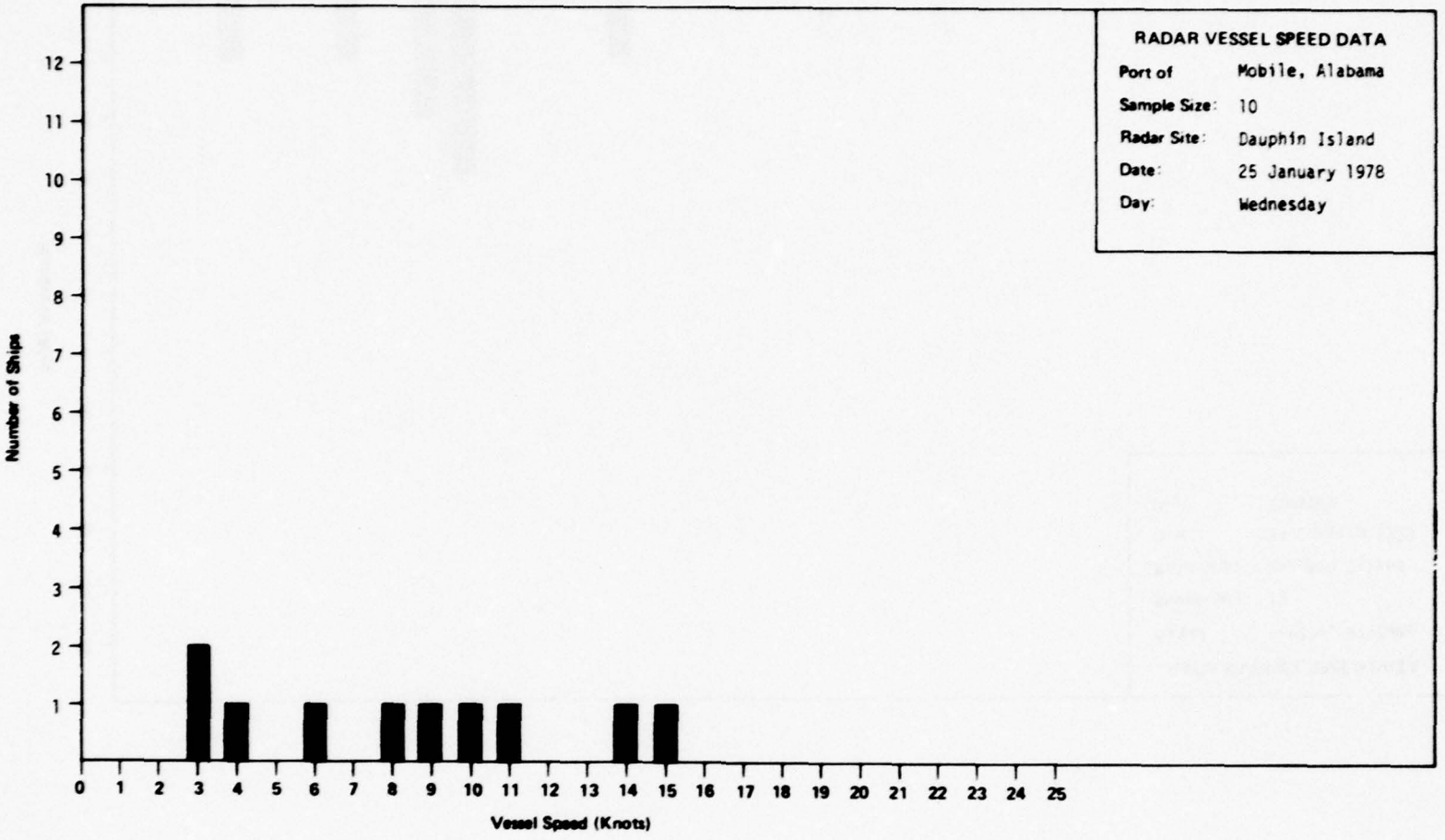
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 10
Radar Site: Dauphin Island
Date: 25 January 1978
Day: Wednesday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-13

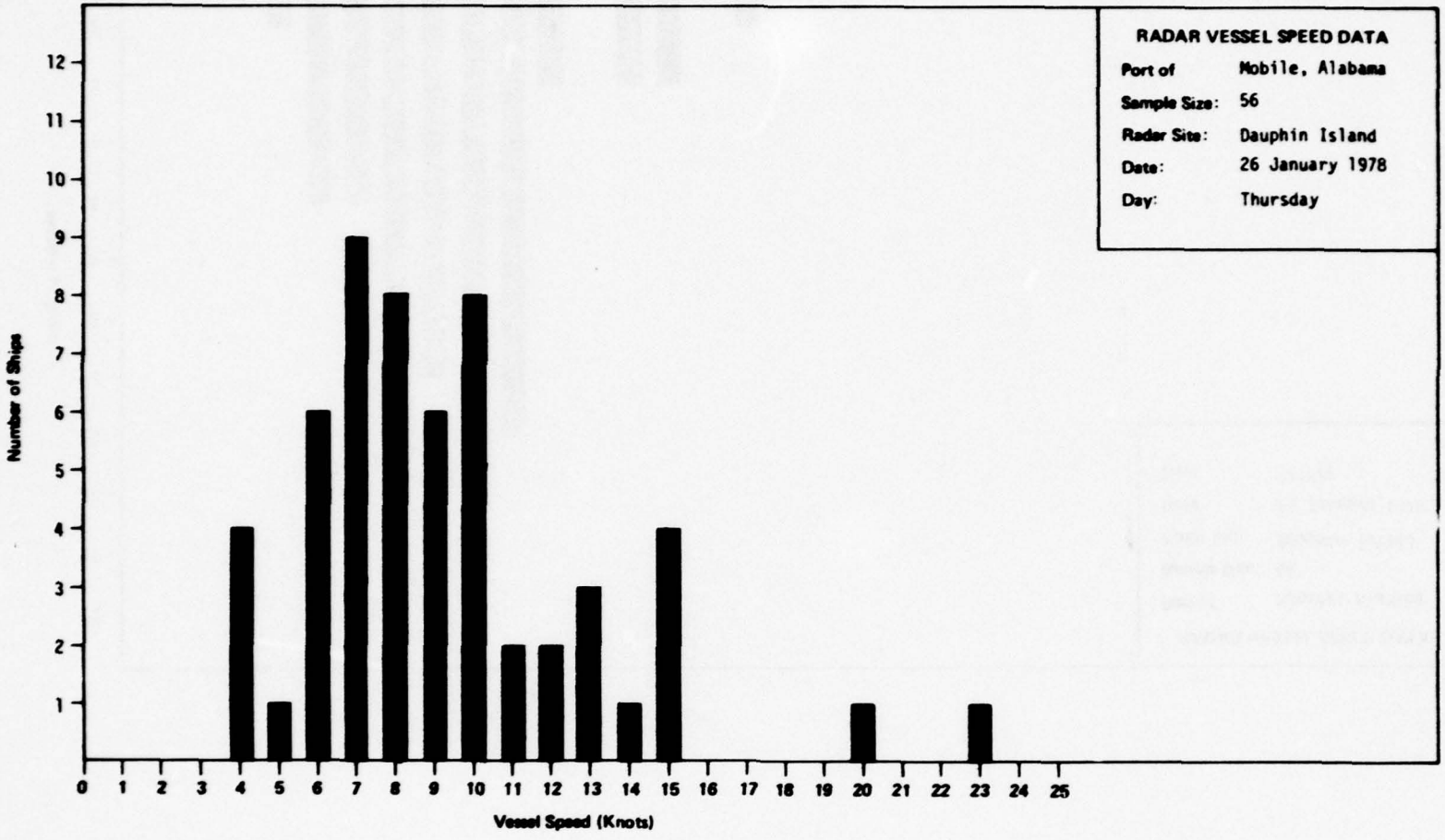
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 56
Radar Site: Dauphin Island
Date: 26 January 1978
Day: Thursday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-14

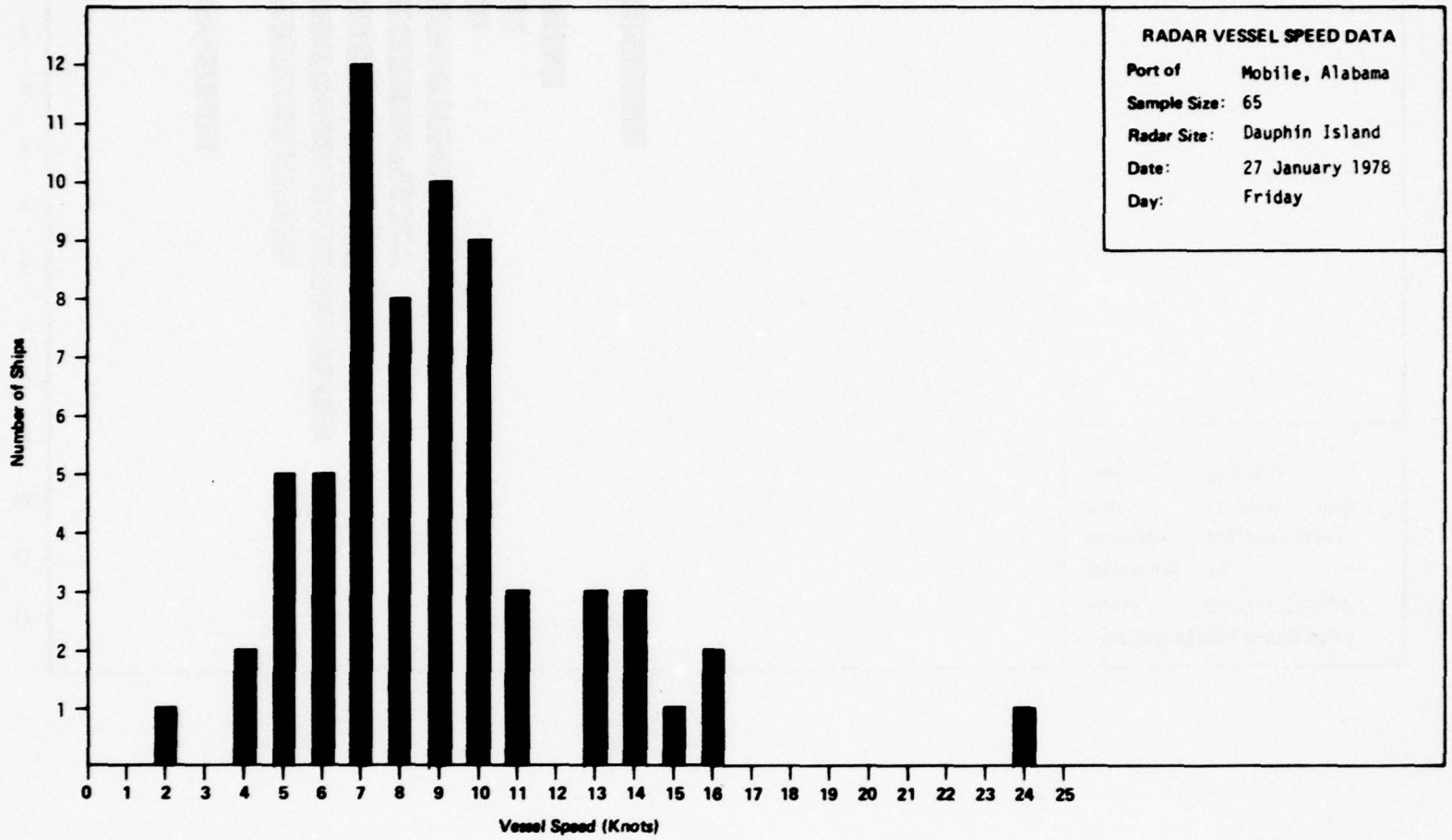
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 65
Radar Site: Dauphin Island
Date: 27 January 1978
Day: Friday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-15

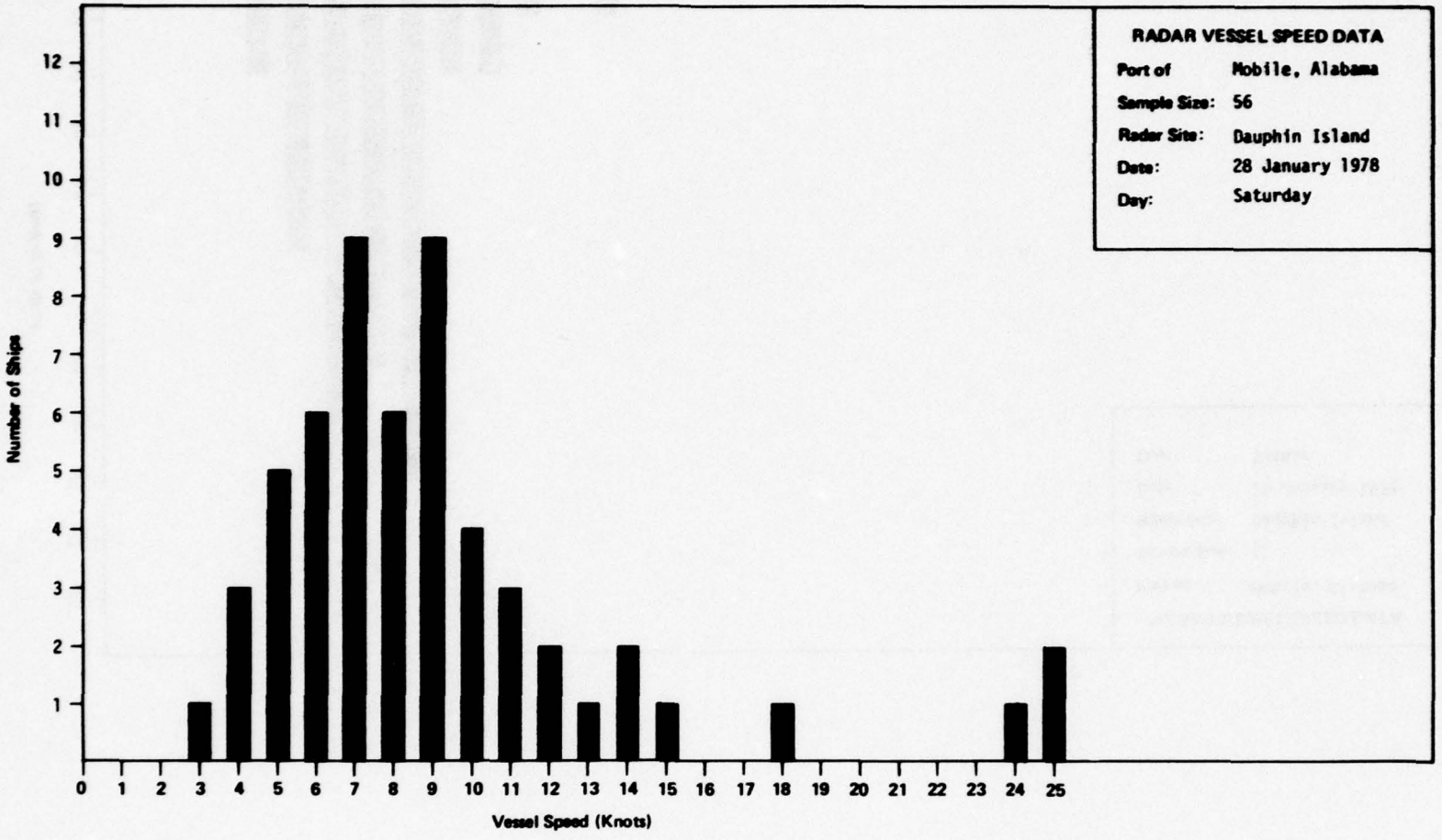
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 56
Radar Site: Dauphin Island
Date: 28 January 1978
Day: Saturday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-16

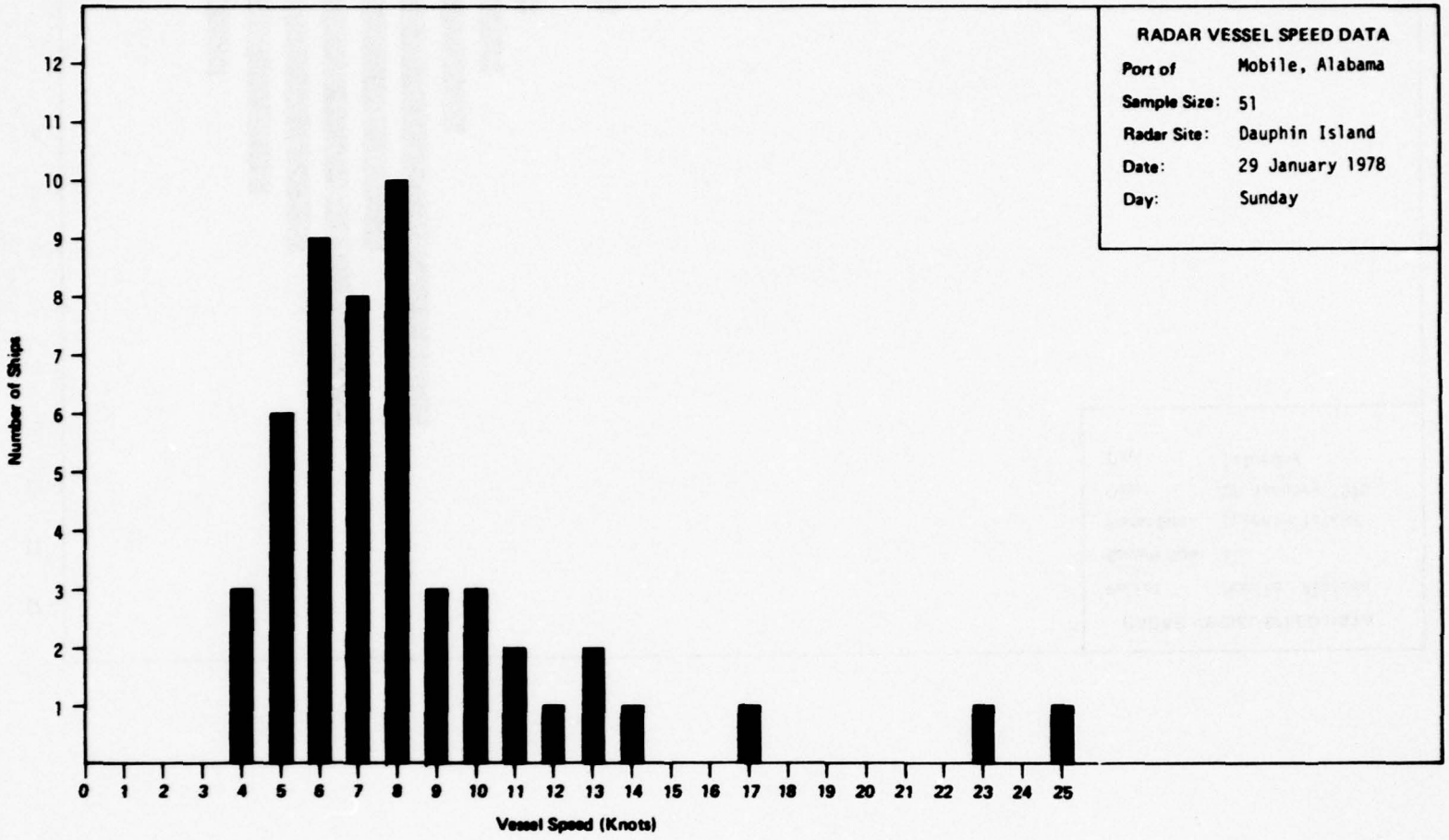
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 51
Radar Site: Dauphin Island
Date: 29 January 1978
Day: Sunday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-17

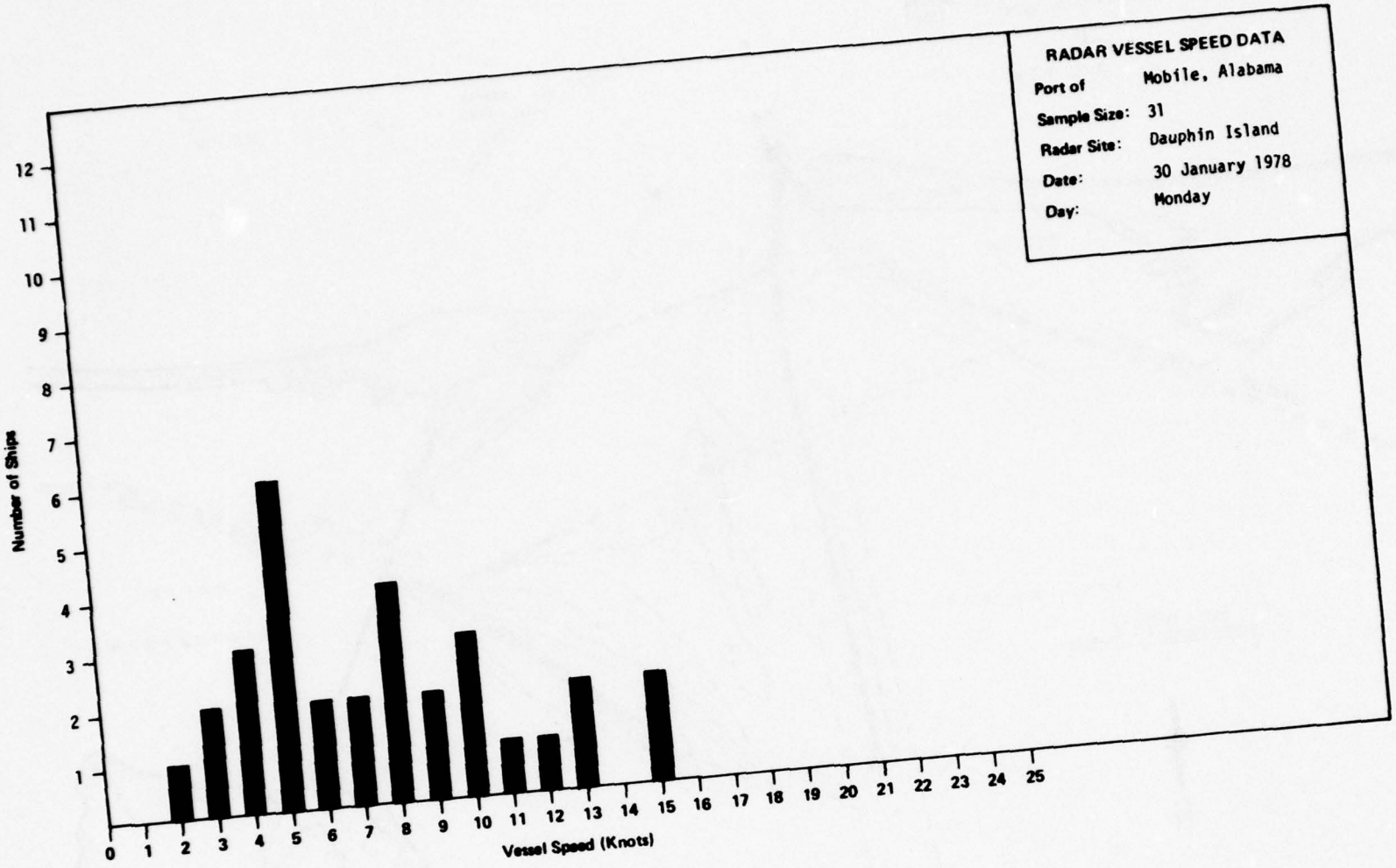
RADAR VESSEL SPEED DATA
Port of Mobile, Alabama
Sample Size: 31
Radar Site: Dauphin Island
Date: 30 January 1978
Day: Monday
Number of Ships
Vessel Speed (Knots)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12

FIGURE 2-18

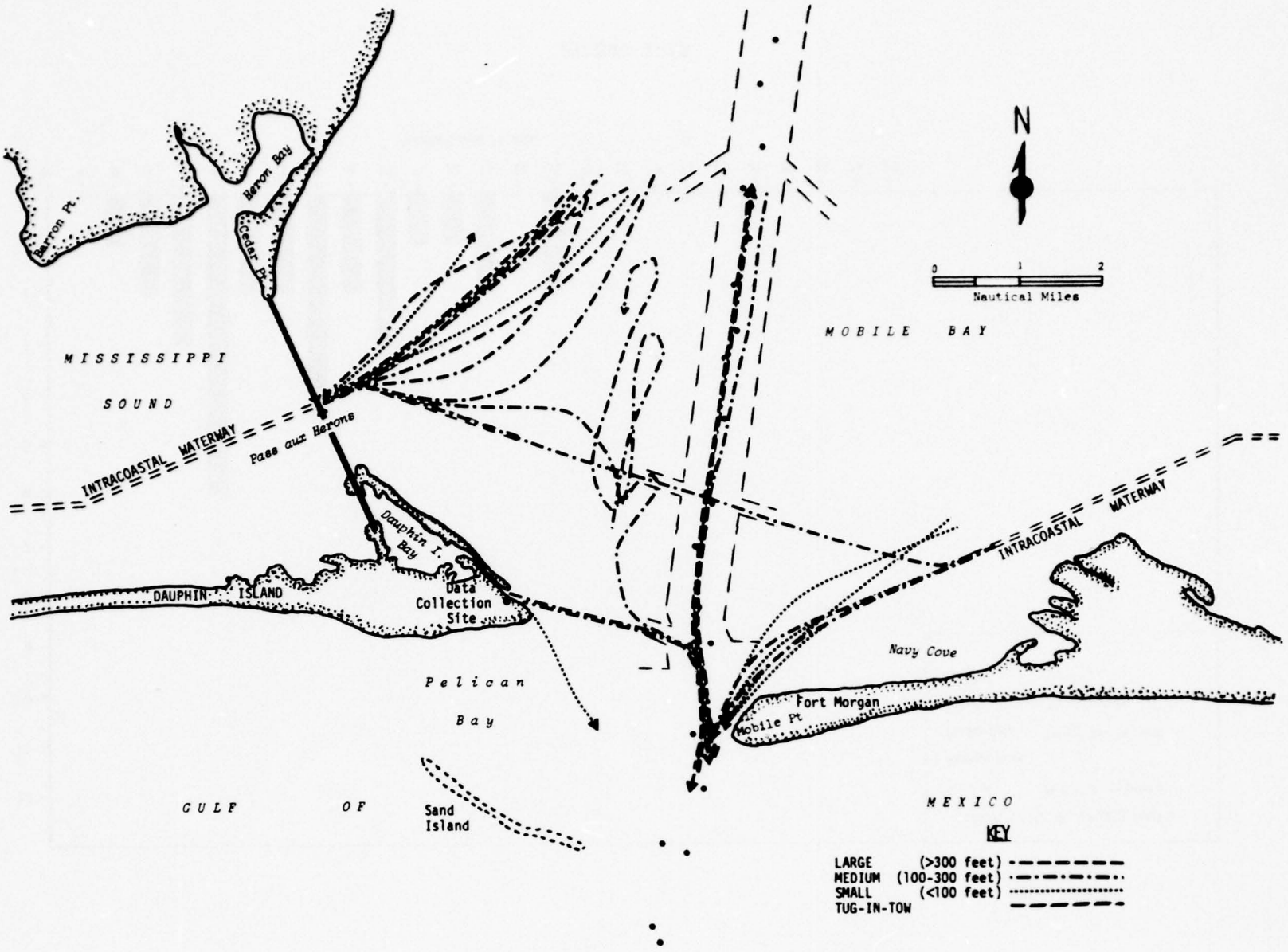

FIGURE 2-19: ROUTE IDENTIFICATION OF THE MARINE TRAFFIC AT MOBILE BETWEEN 0000 AND 1800, THURSDAY, 26 JANUARY 1978

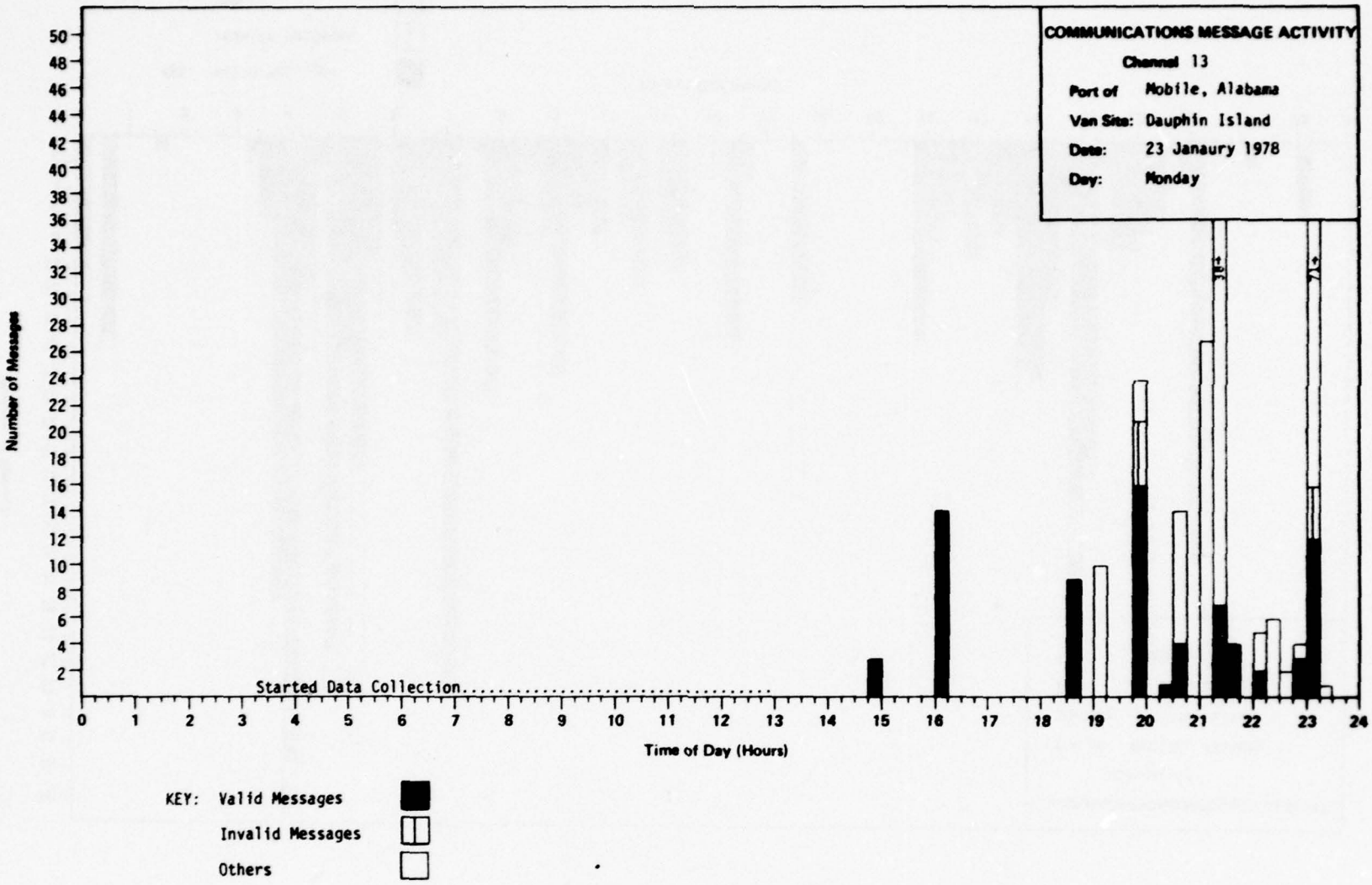
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 23 Janaury 1978
Day: Monday
Number of Messages
Time of Day (Hours)
Started Data Collection.....
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-20

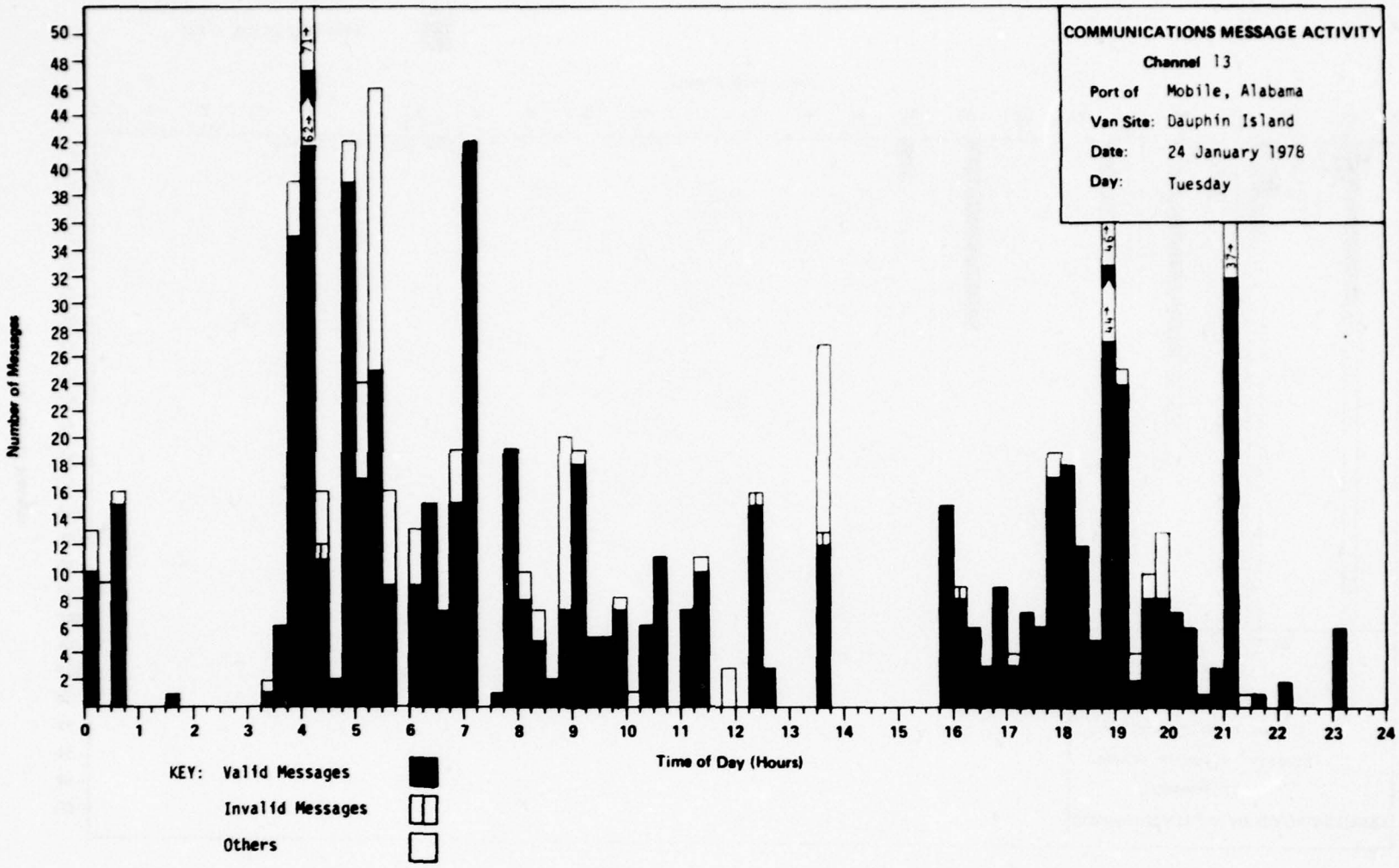
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 24 January 1978
Day: Tuesday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-21

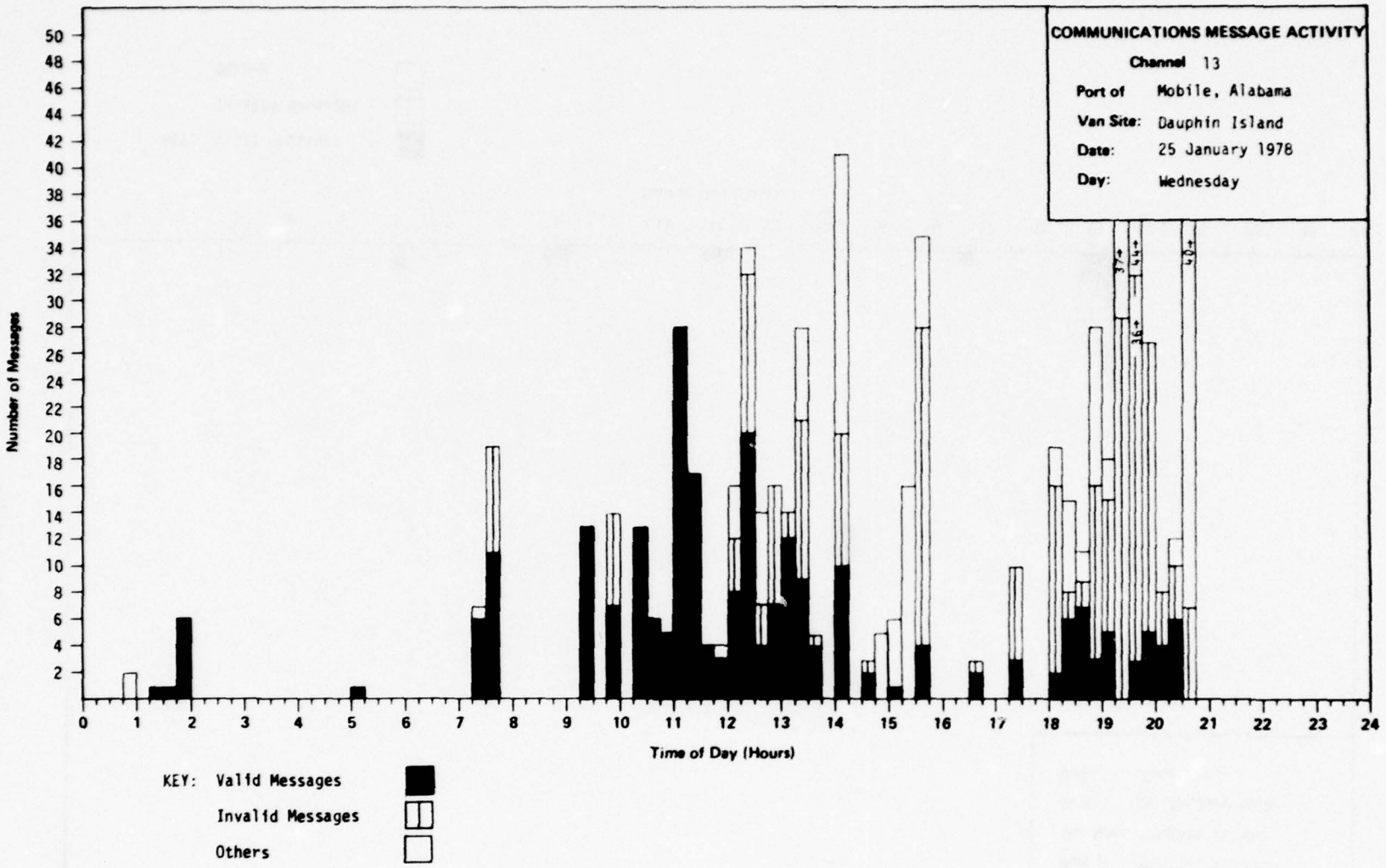
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 25 January 1978
Day: Wednesday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-22

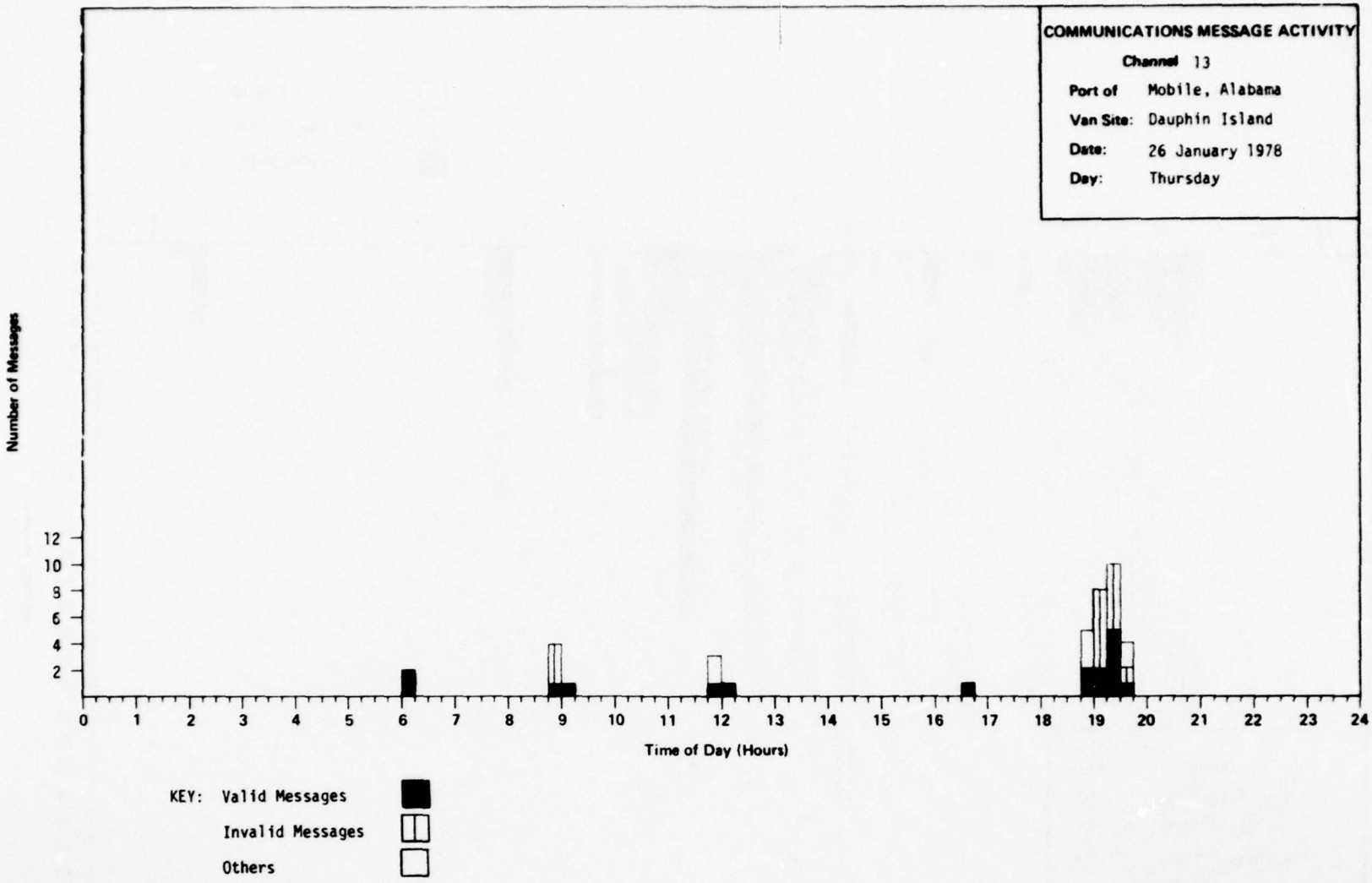
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 26 January 1978
Day: Thursday
Number of Messages
12
10
8
6
4
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-23

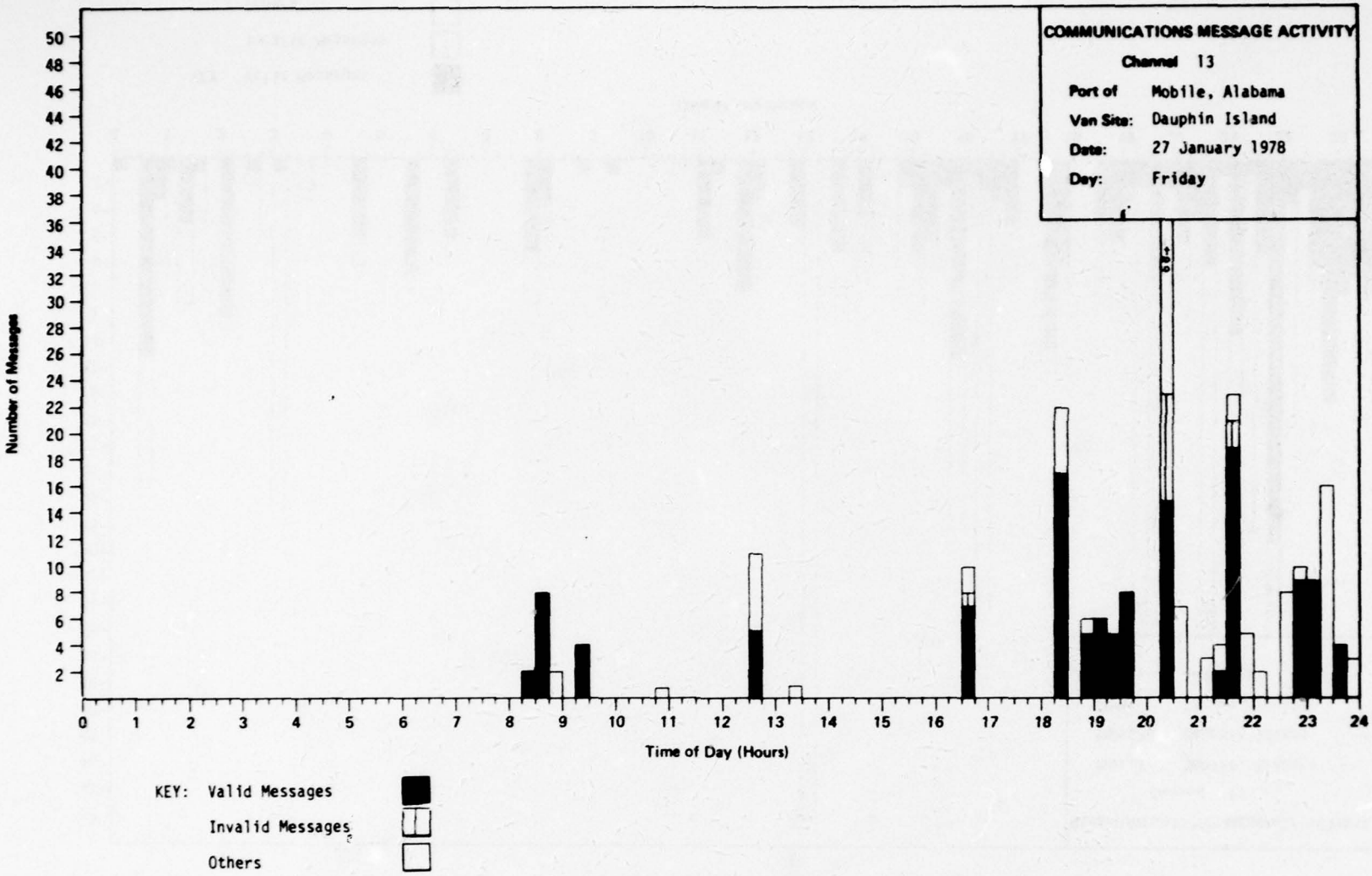
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 27 January 1978
Day: Friday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-24

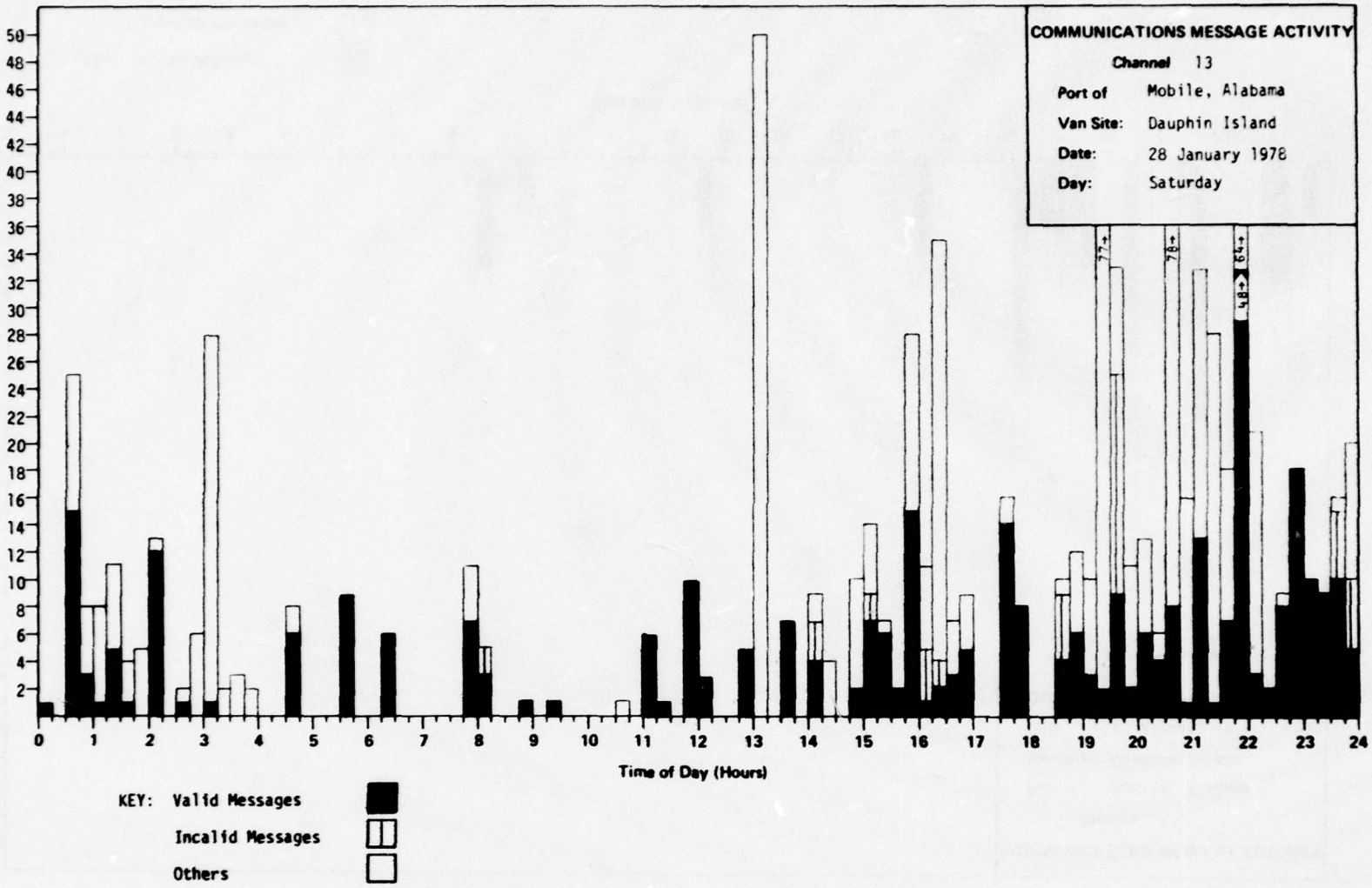
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 28 January 1978
Day: Saturday
77→
78→
48→ 64→
Time of Day (Hours)
KEY: Valid Messages
Incalid Messages
Others

FIGURE 2-25

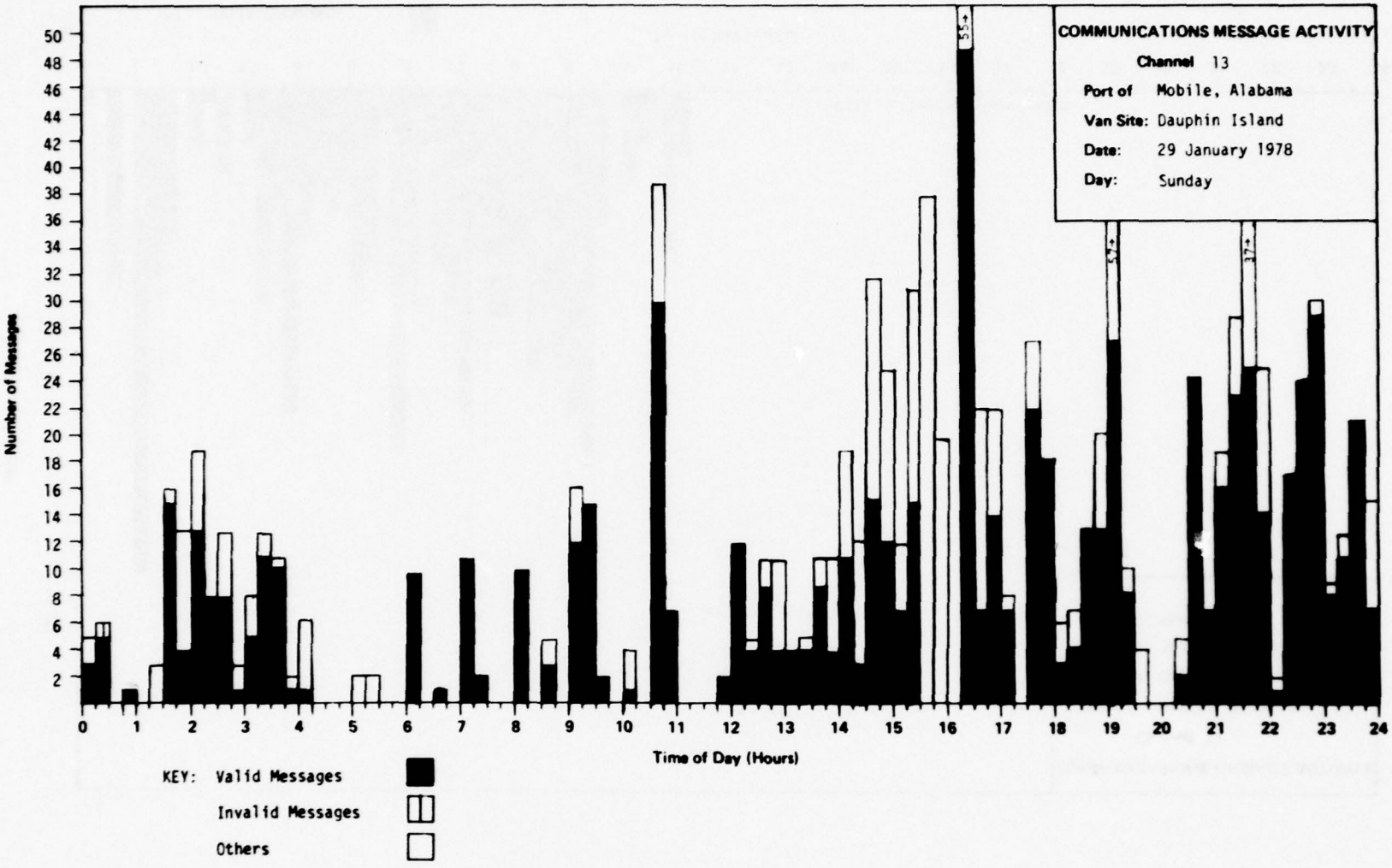
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 29 January 1978
Day: Sunday
55+
37+
37+
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-26

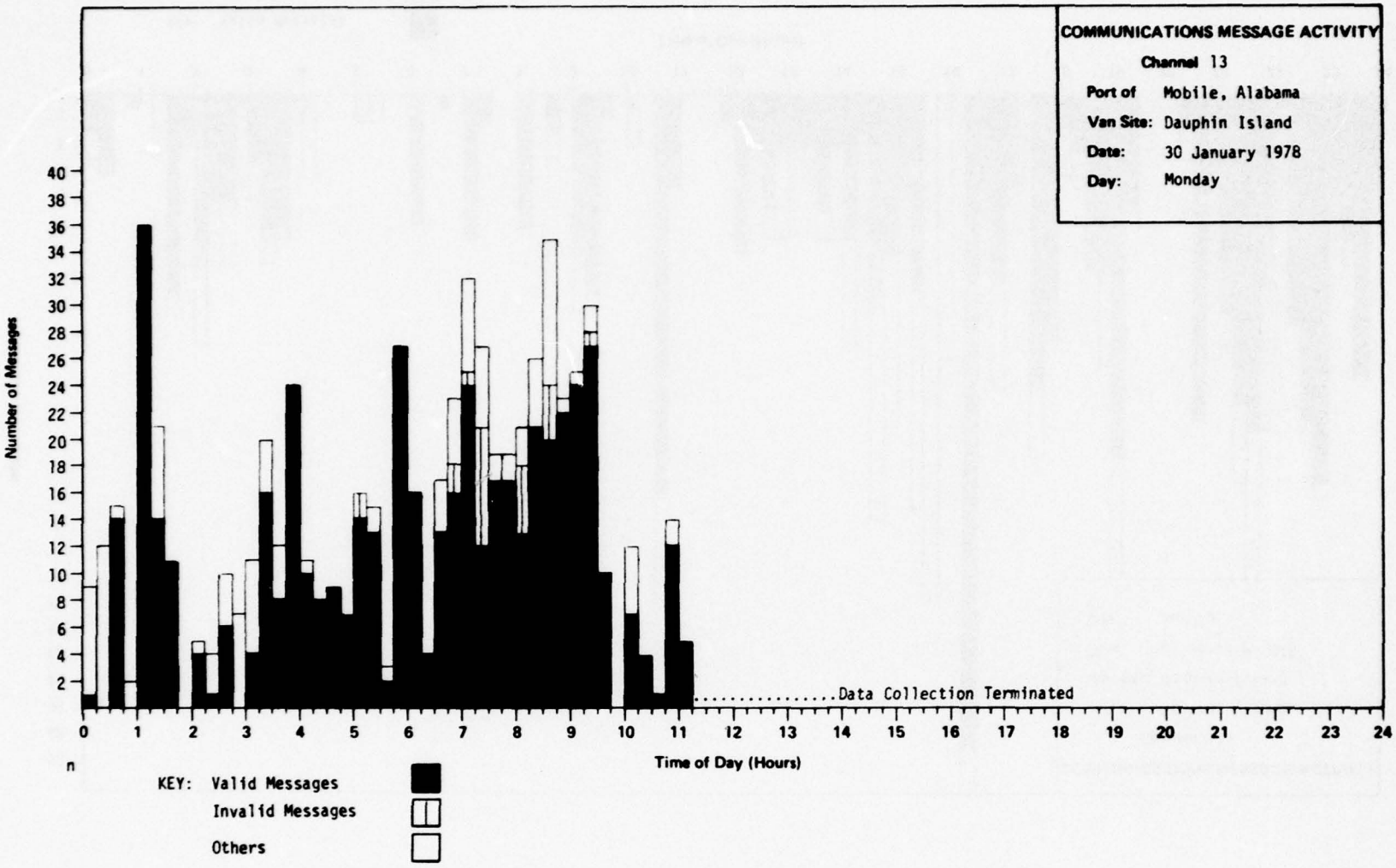
COMMUNICATIONS MESSAGE ACTIVITY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 30 January 1978
Day: Monday
Number of Messages
Time of Day (Hours)
Data Collection Terminated
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-27

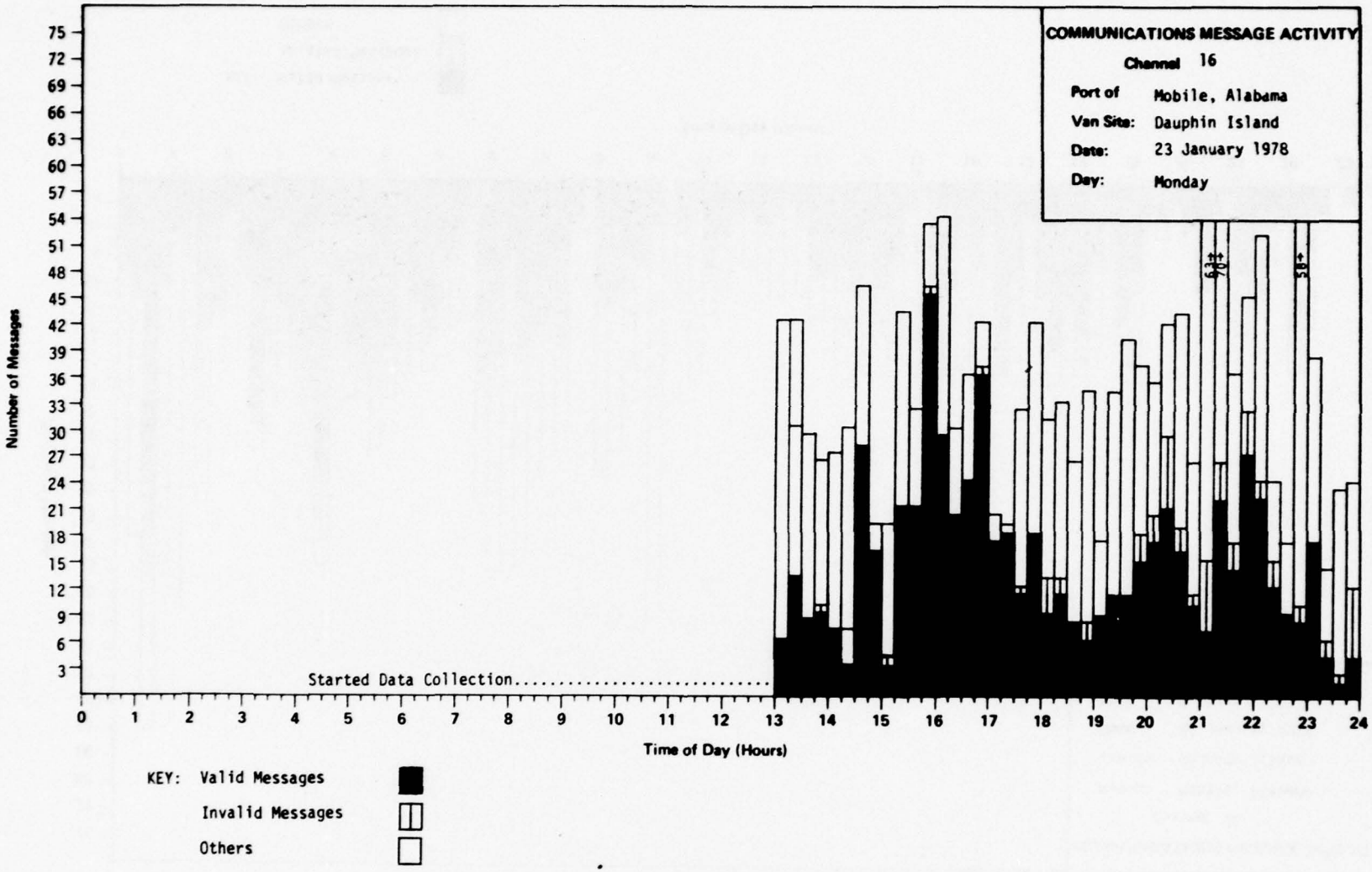
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 23 January 1978
Day: Monday
Number of Messages
Time of Day (Hours)
Started Data Collection.....
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-28

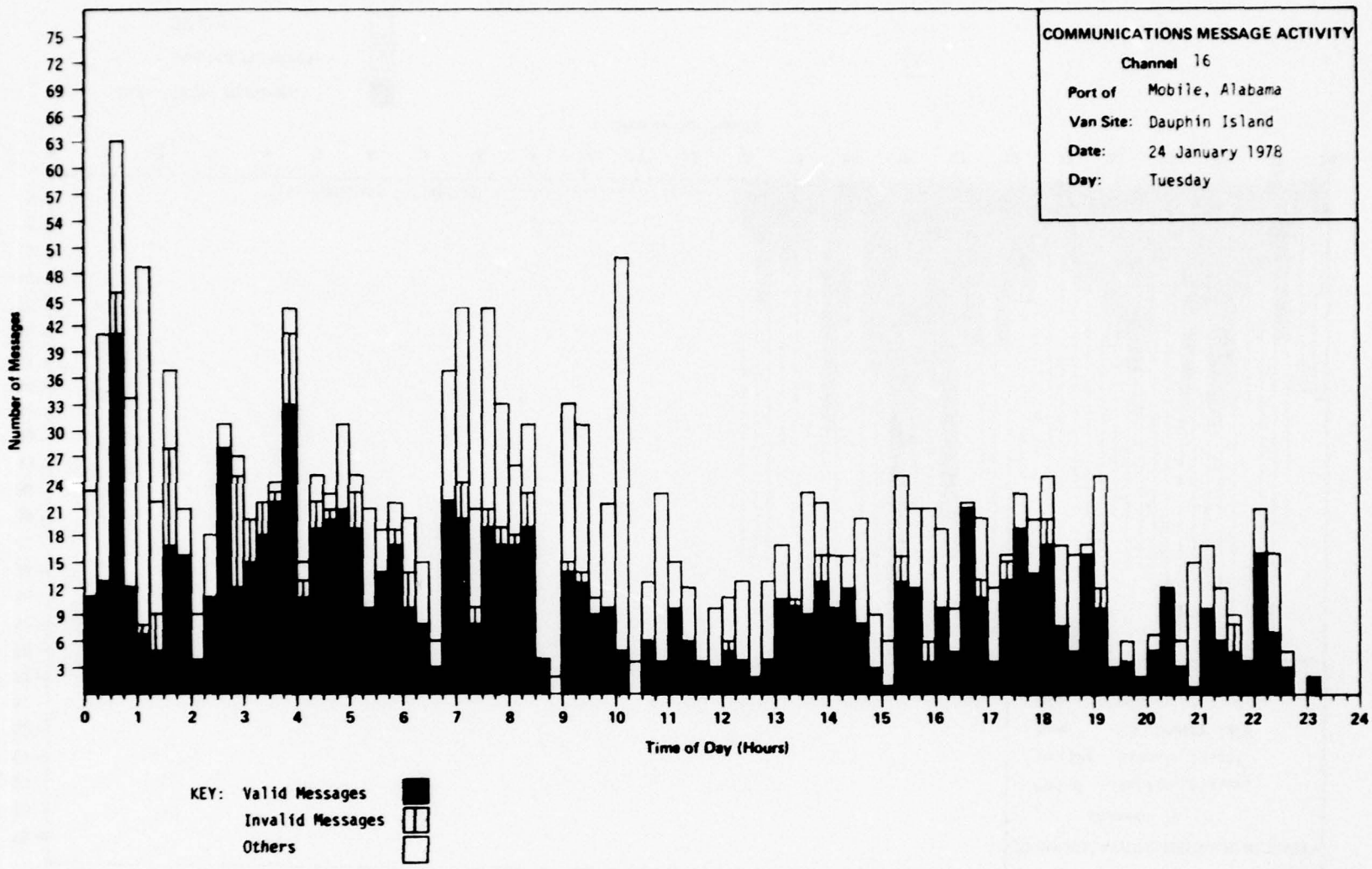
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 24 January 1978
Day: Tuesday
Number of Messages
75
72
69
66
63
60
57
54
51
48
45
42
39
36
33
30
27
24
21
18
15
12
9
6
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-29

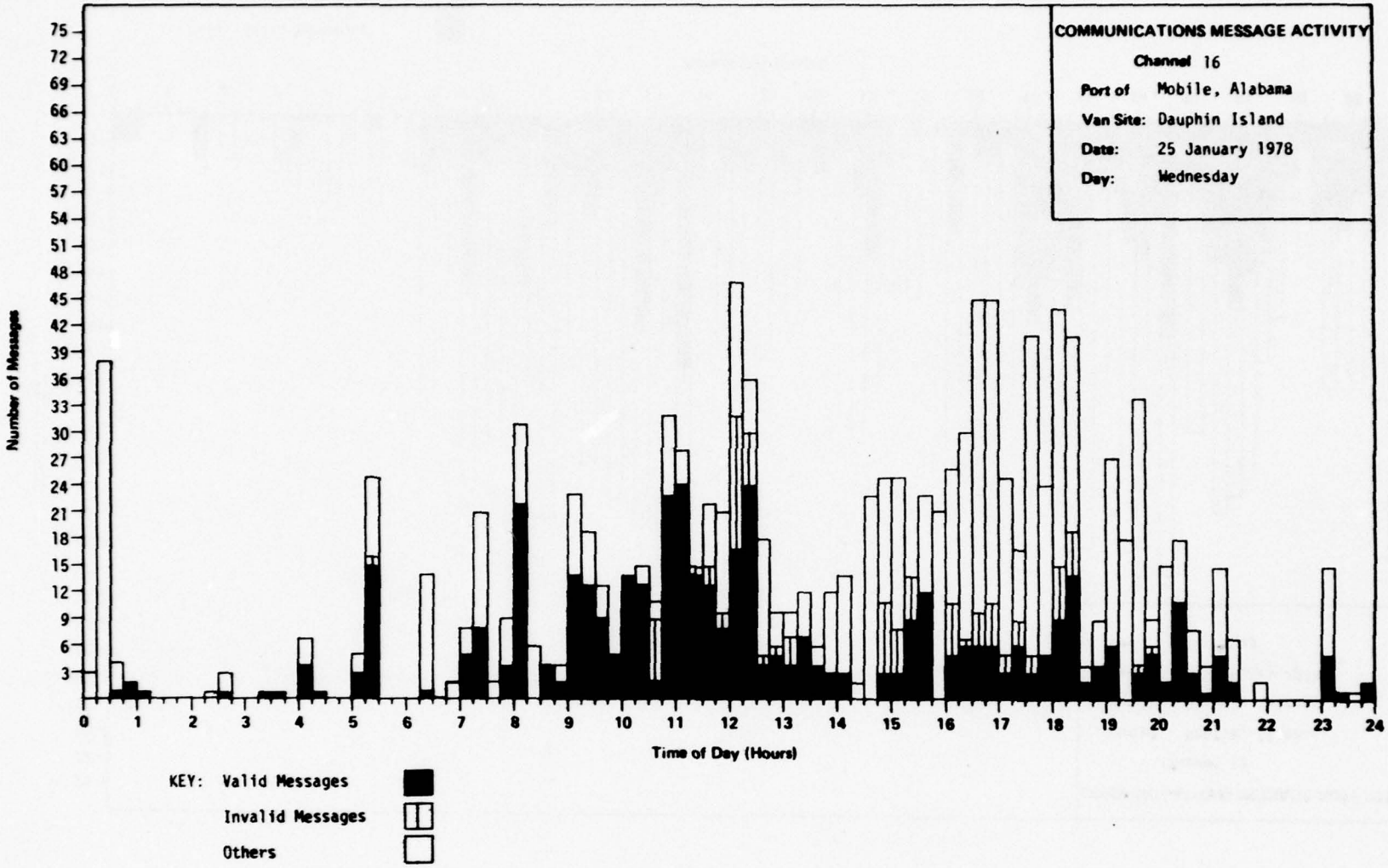
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 25 January 1978
Day: Wednesday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-30

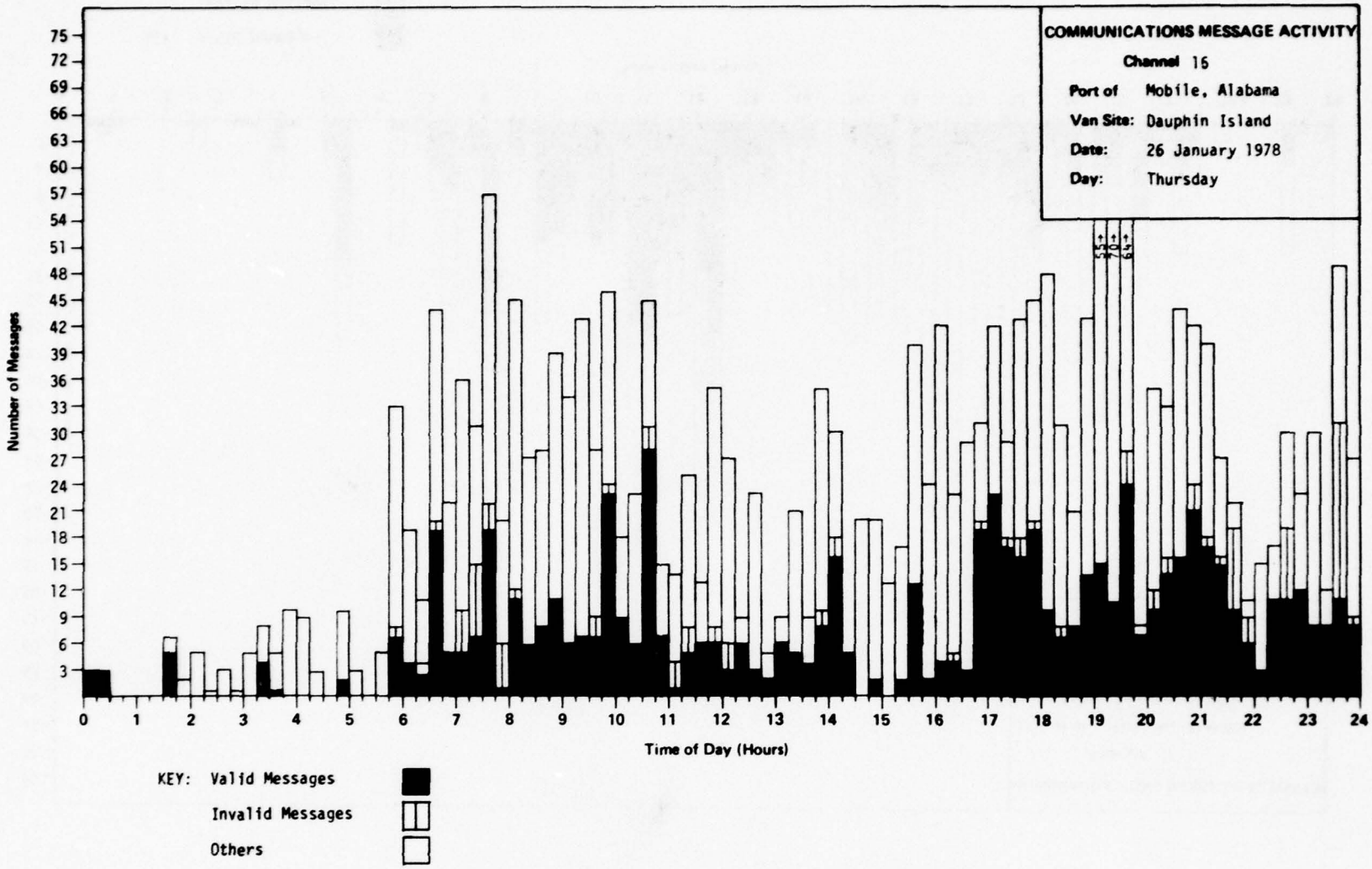
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 26 January 1978
Day: Thursday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-31

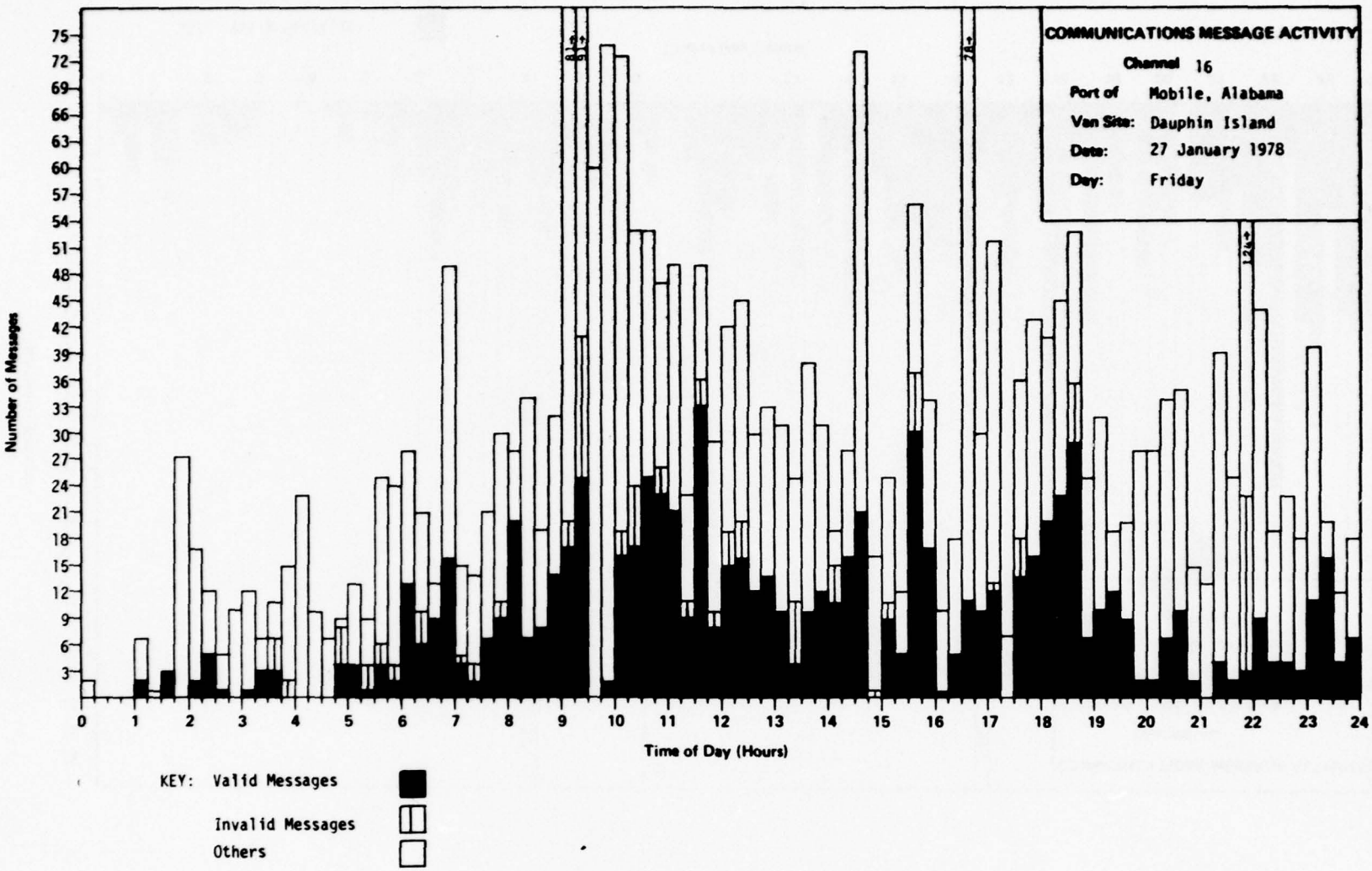
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 27 January 1978
Day: Friday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-32

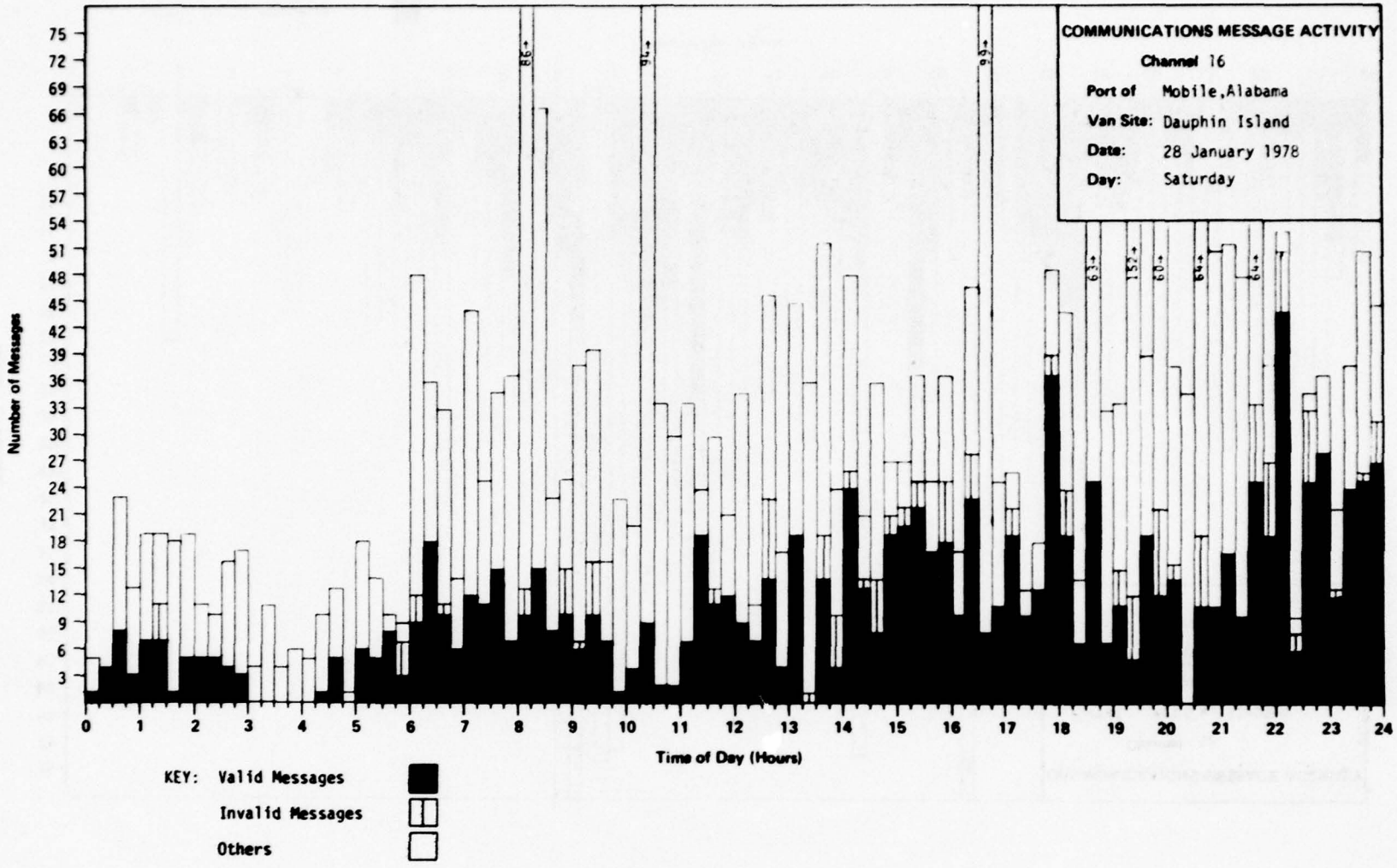
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 28 January 1978
Day: Saturday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-33

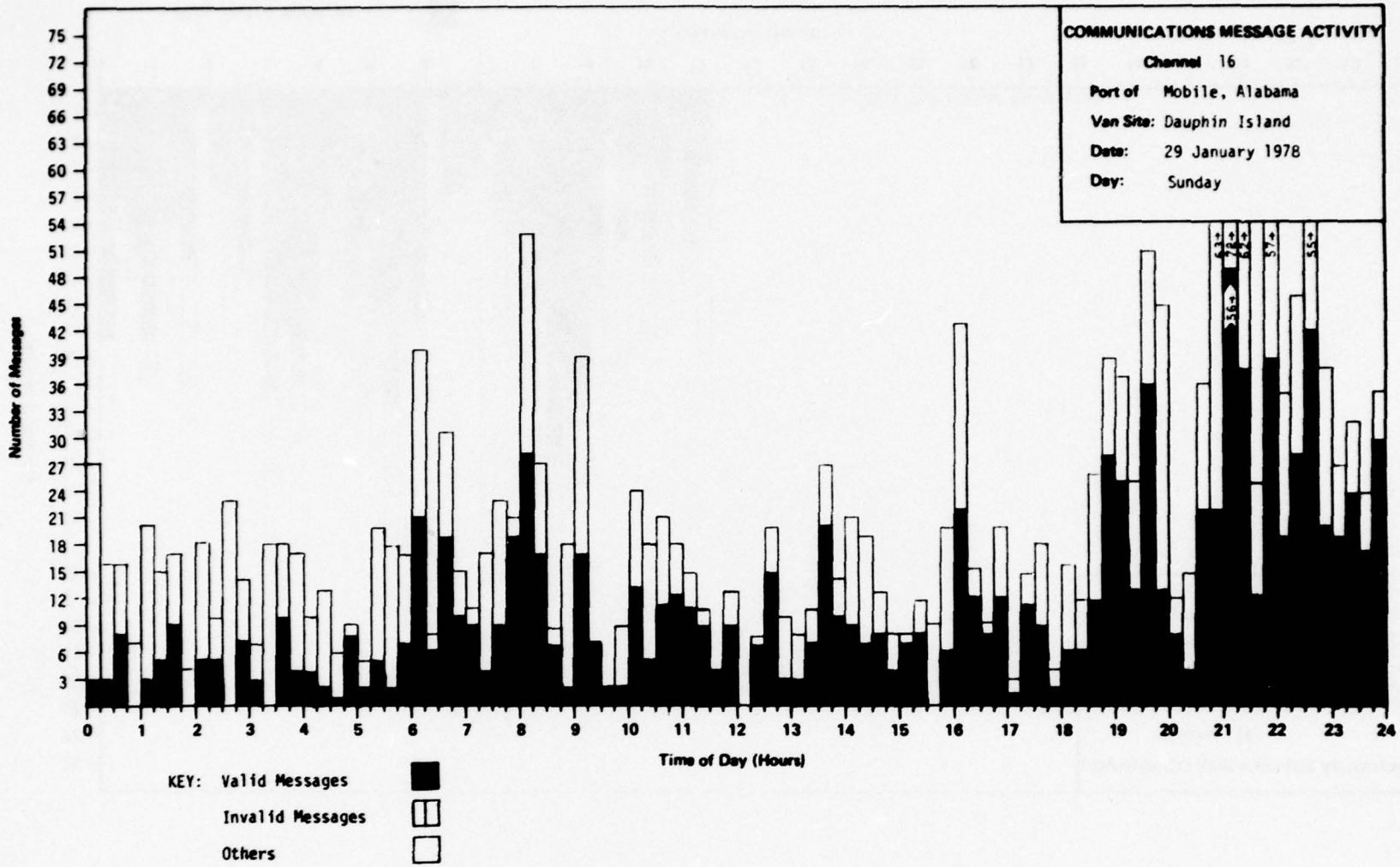
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 29 January 1978
Day: Sunday
Number of Messages
Time of Day (Hours)
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-34

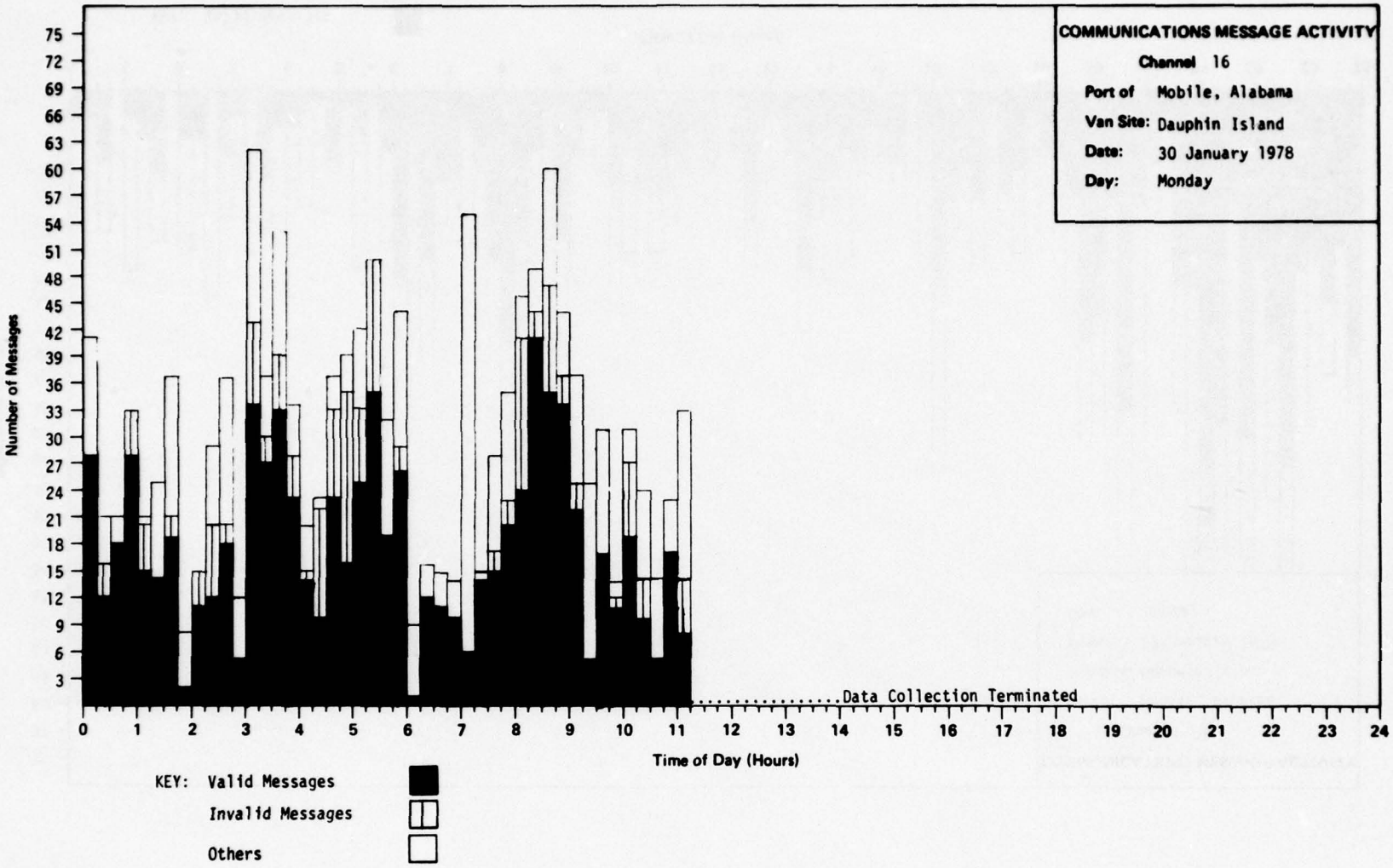
COMMUNICATIONS MESSAGE ACTIVITY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 30 January 1978
Day: Monday
Number of Messages
75
72
69
66
63
60
57
54
51
48
45
42
39
36
33
30
27
24
21
18
15
12
9
6
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
Data Collection Terminated
KEY: Valid Messages
Invalid Messages
Others

FIGURE 2-35

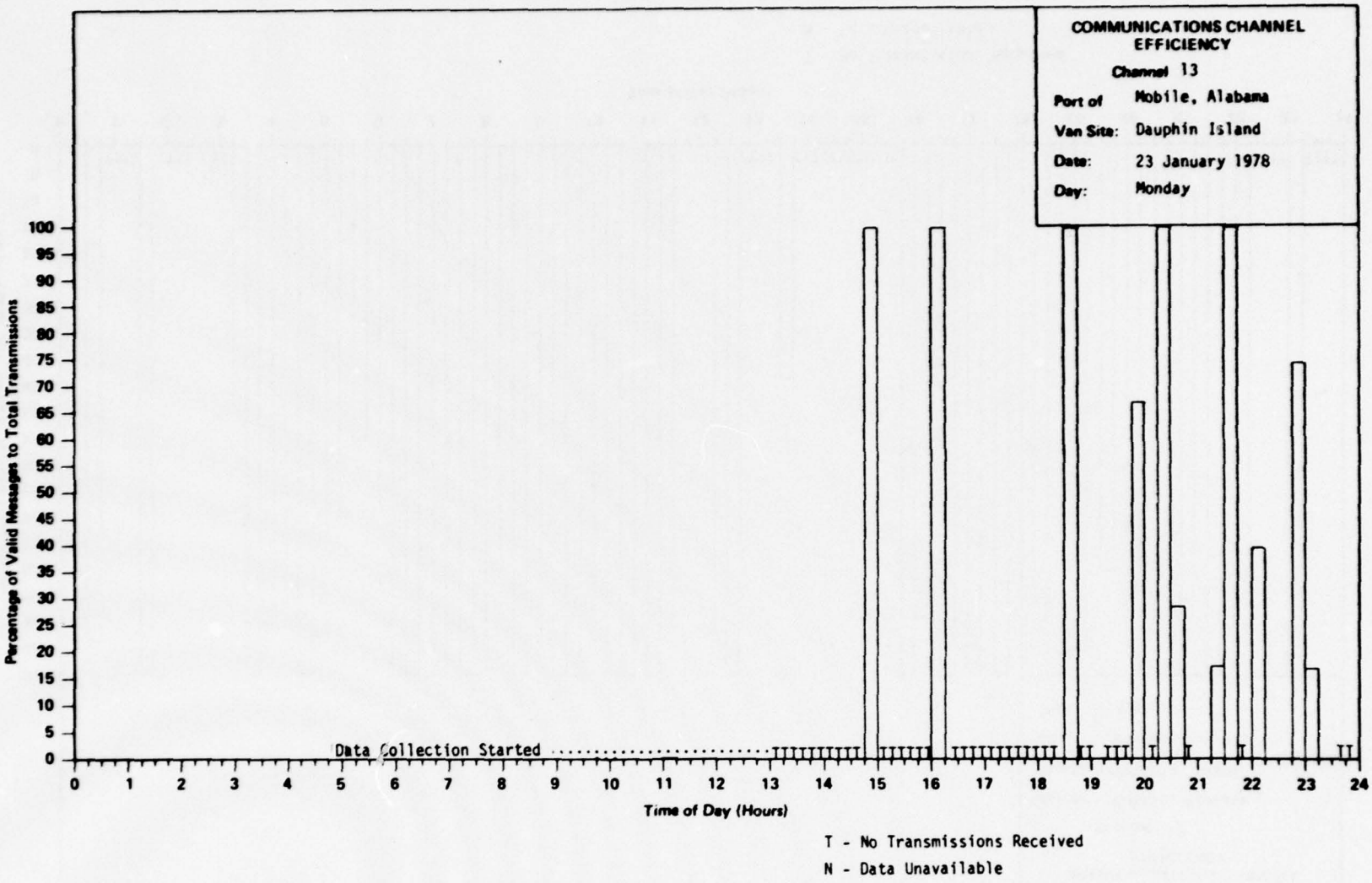
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 23 January 1978
Day: Monday
Percentage of Valid Messages to Total Transmissions
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Data Collection Started
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-36

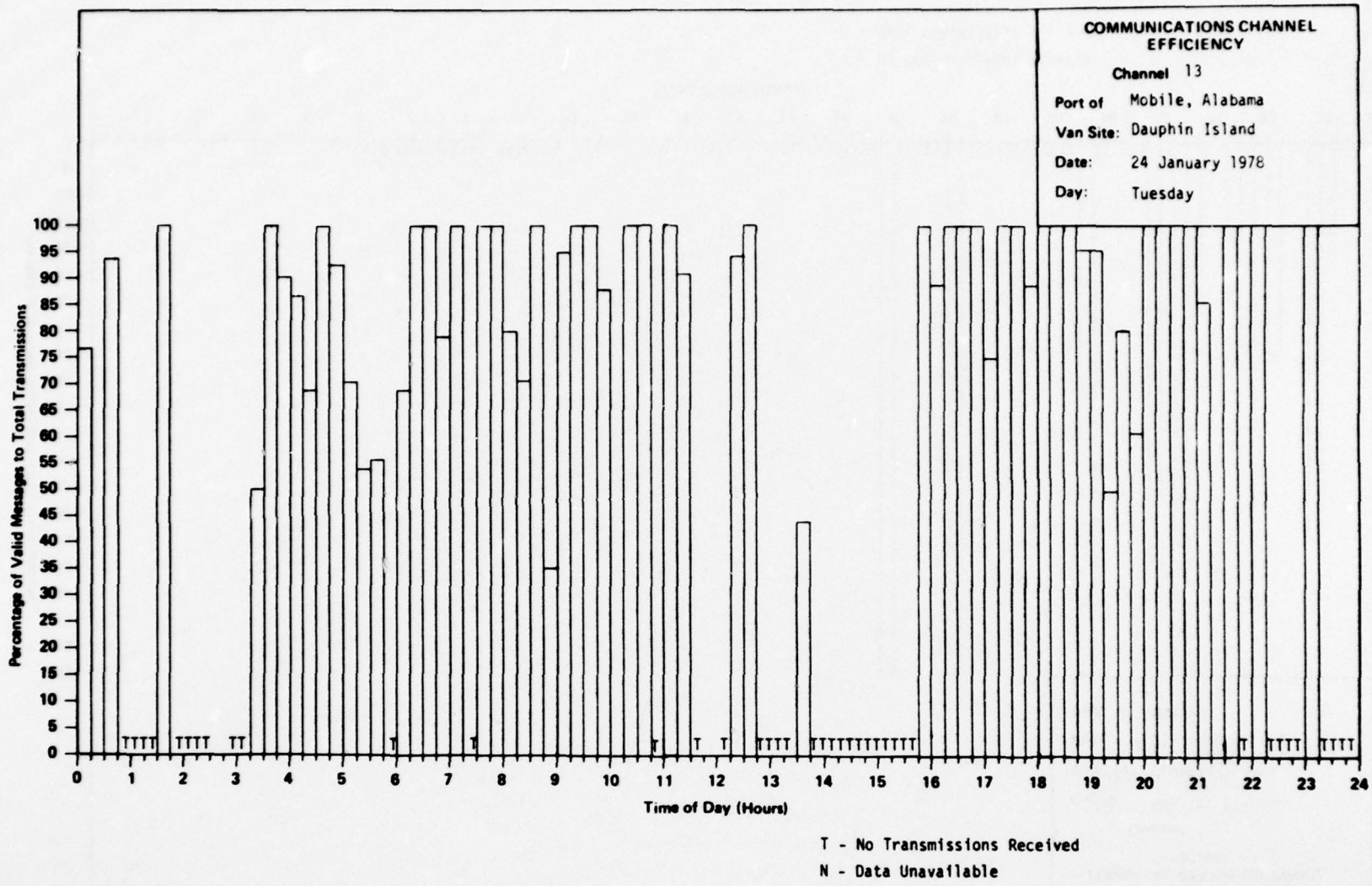
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 24 January 1978
Day: Tuesday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-37

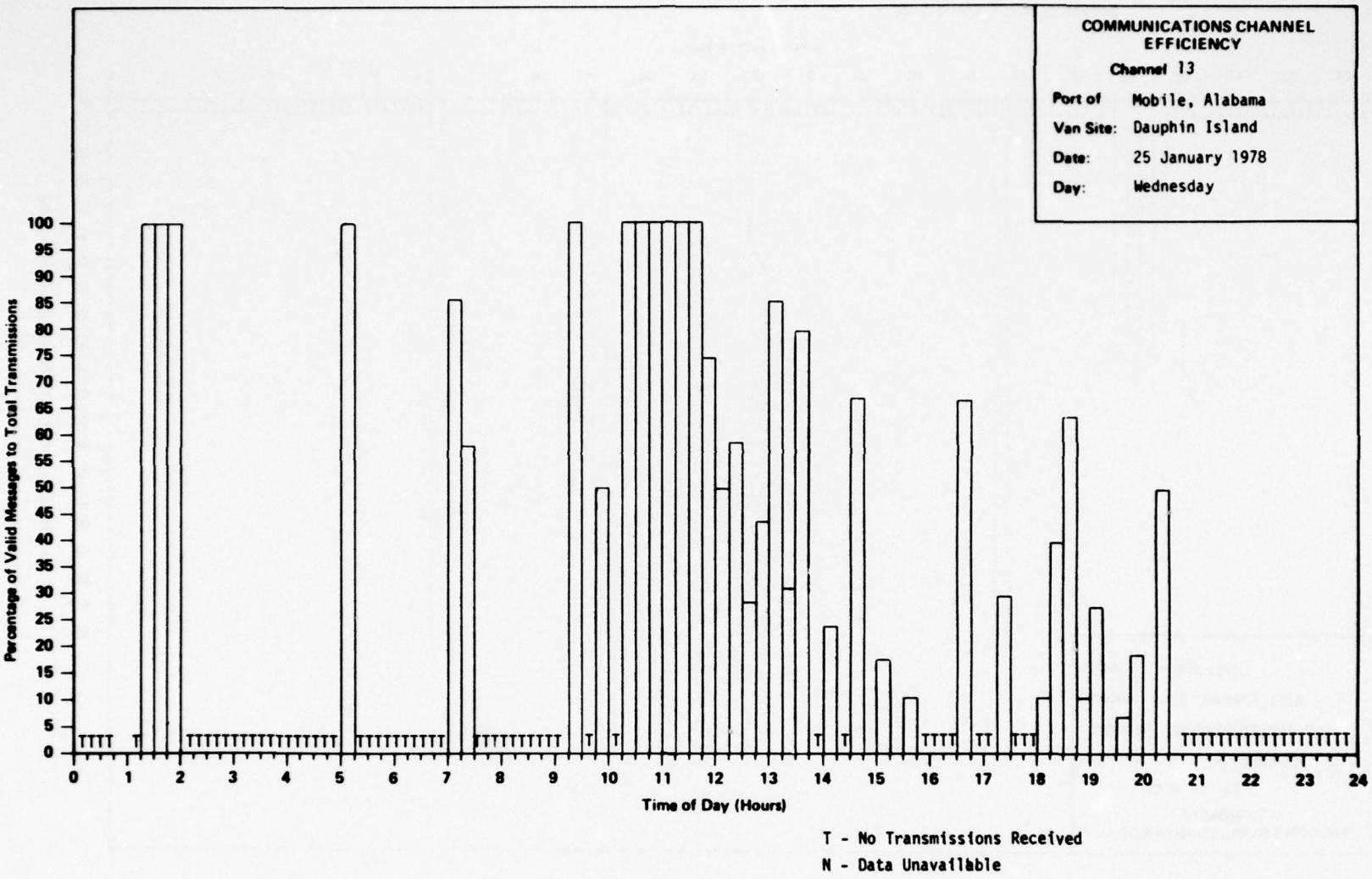
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 25 January 1978
Day: Wednesday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-38

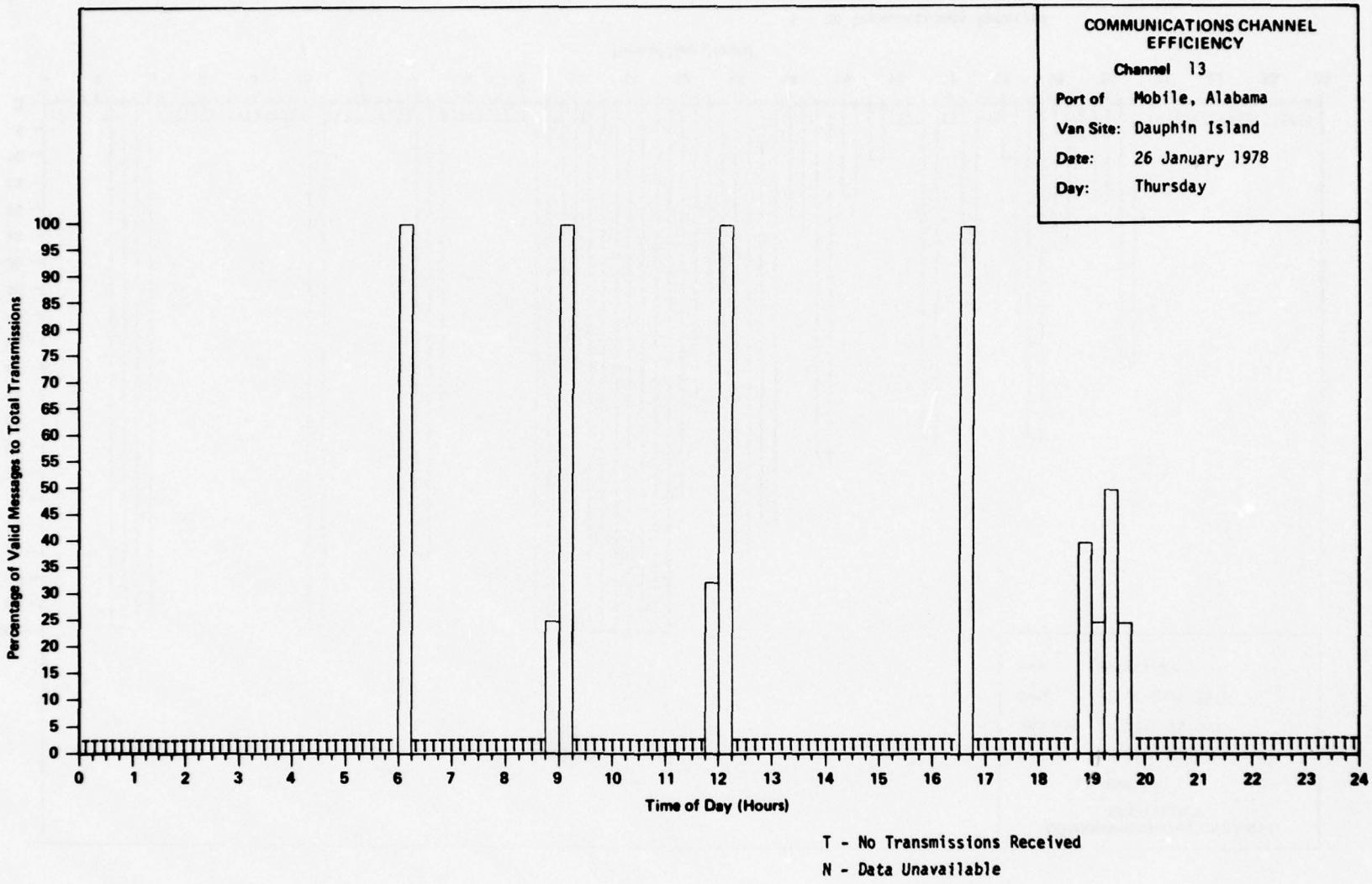
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 26 January 1978
Day: Thursday
Percentage of Valid Messages to Total Transmissions
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-39

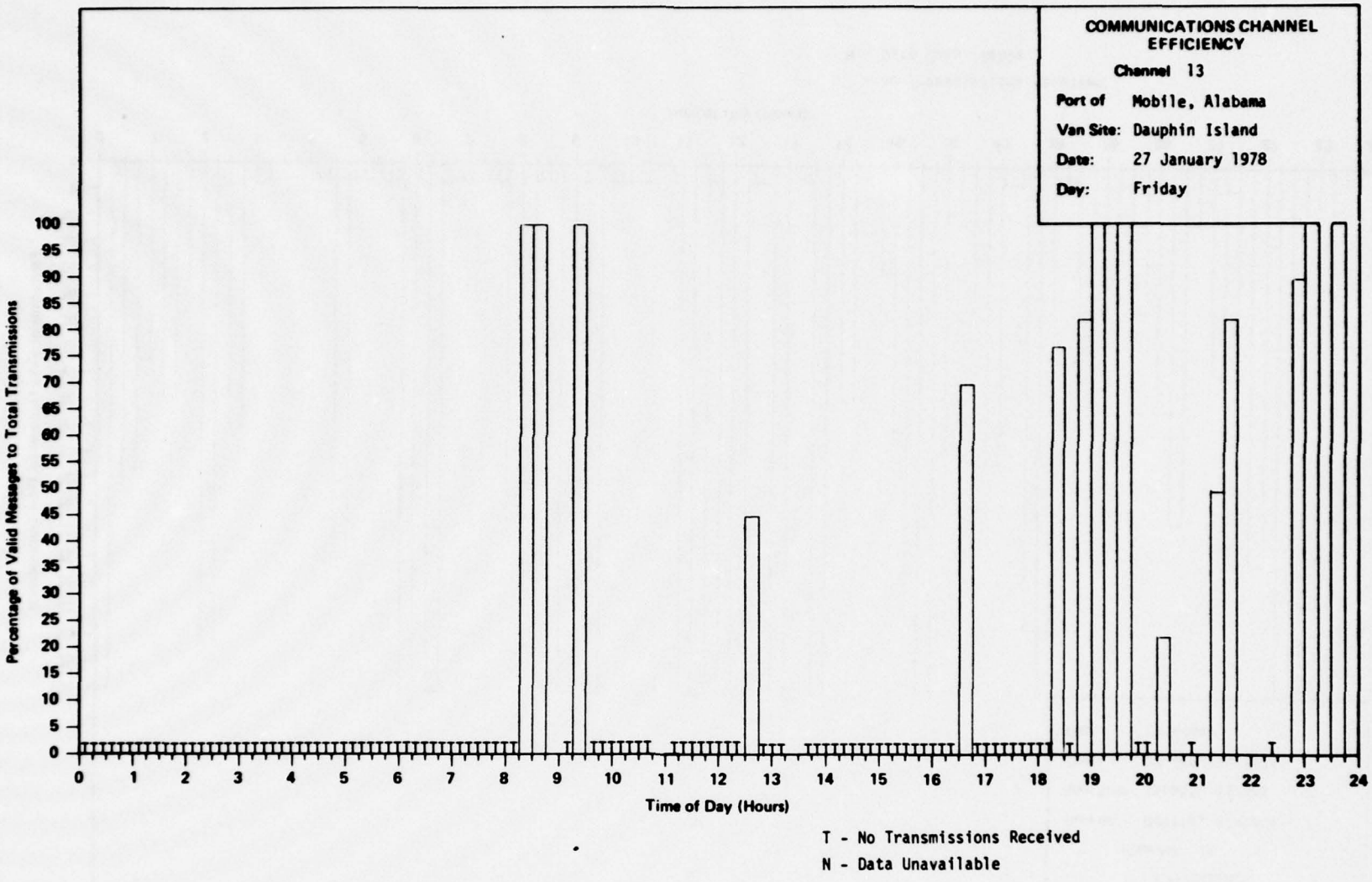
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 27 January 1978
Day: Friday
Percentage of Valid Messages to Total Transmissions
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-40

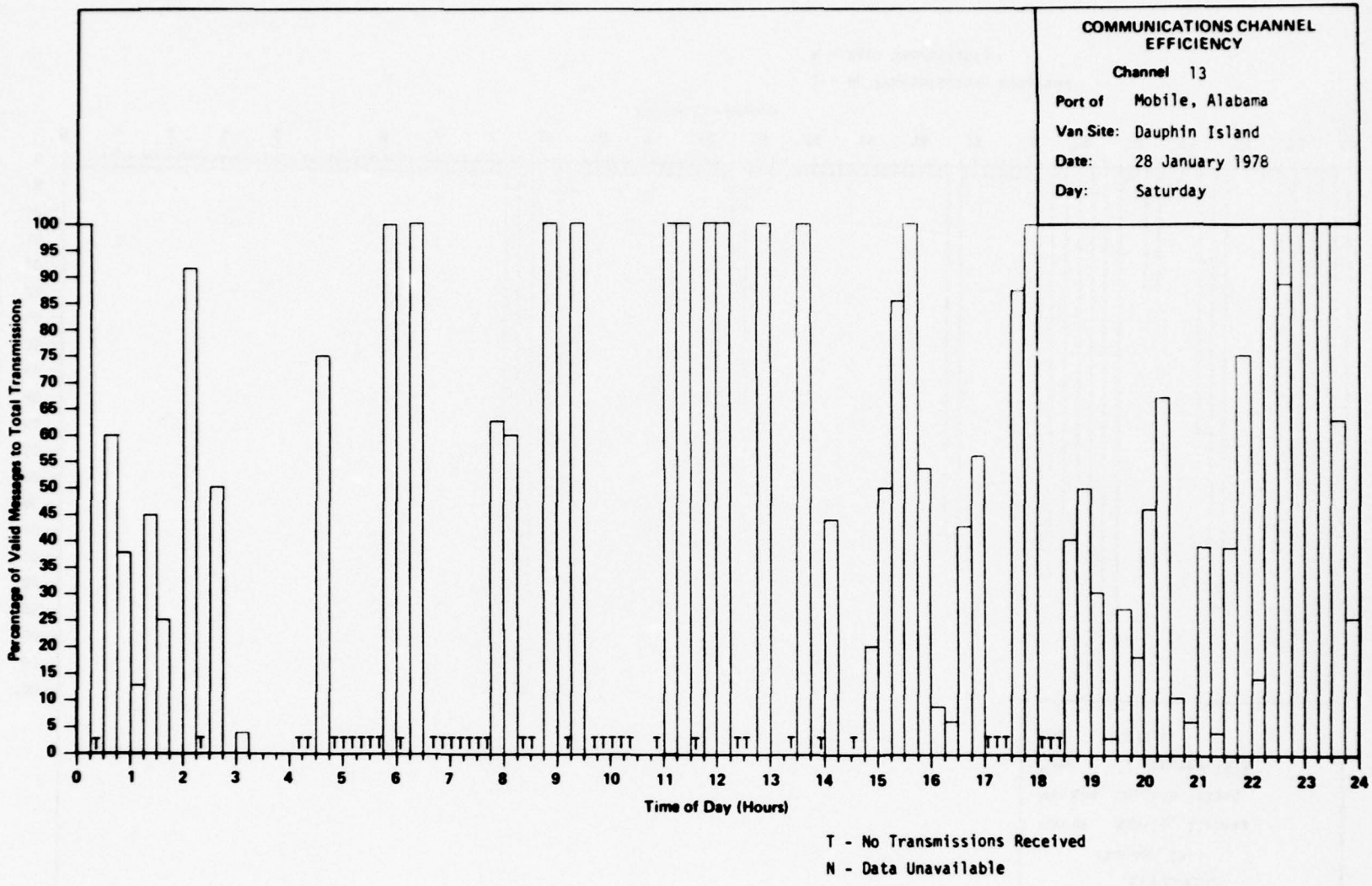
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 28 January 1978
Day: Saturday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-41

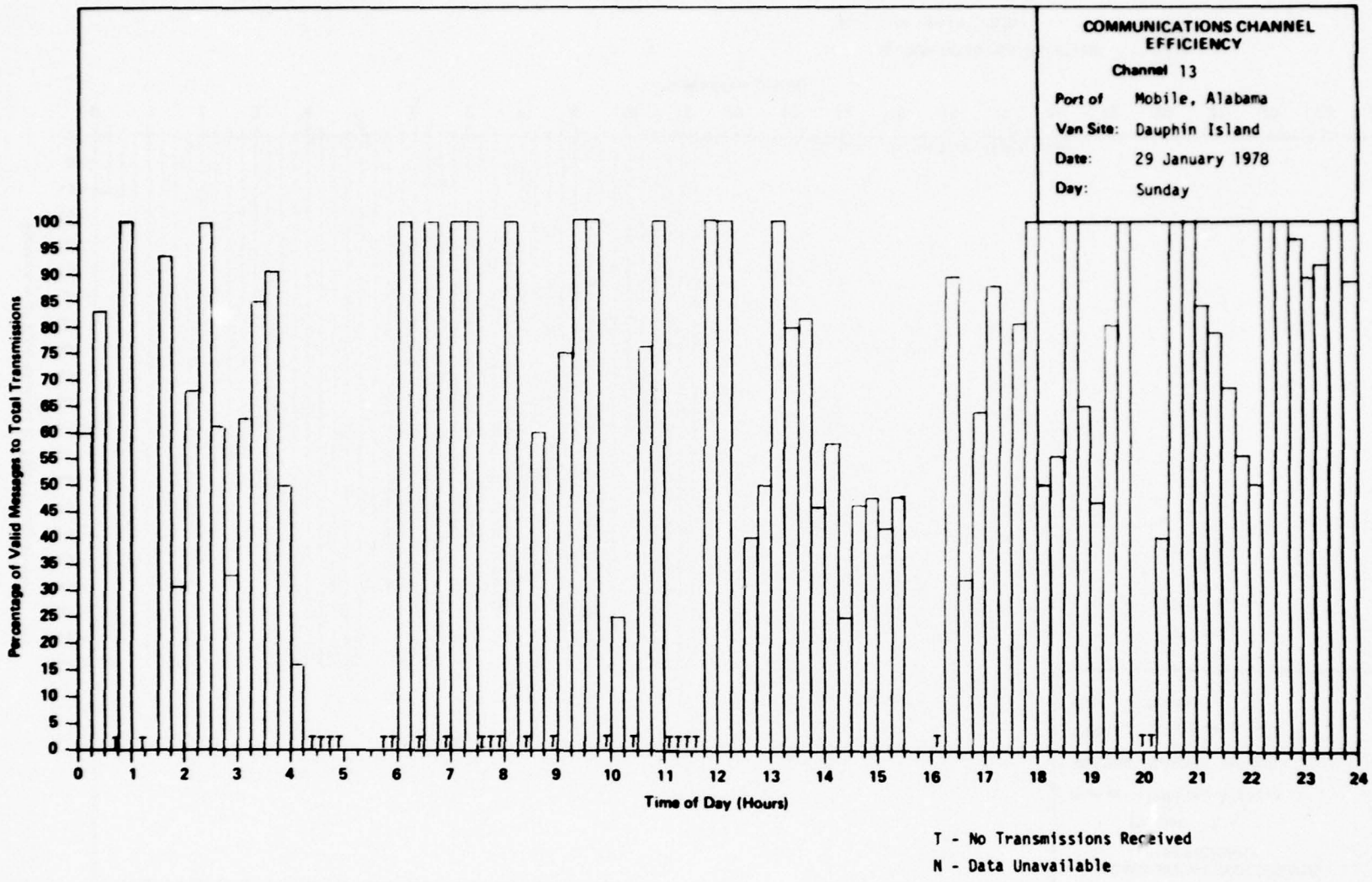
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 29 January 1978
Day: Sunday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-42

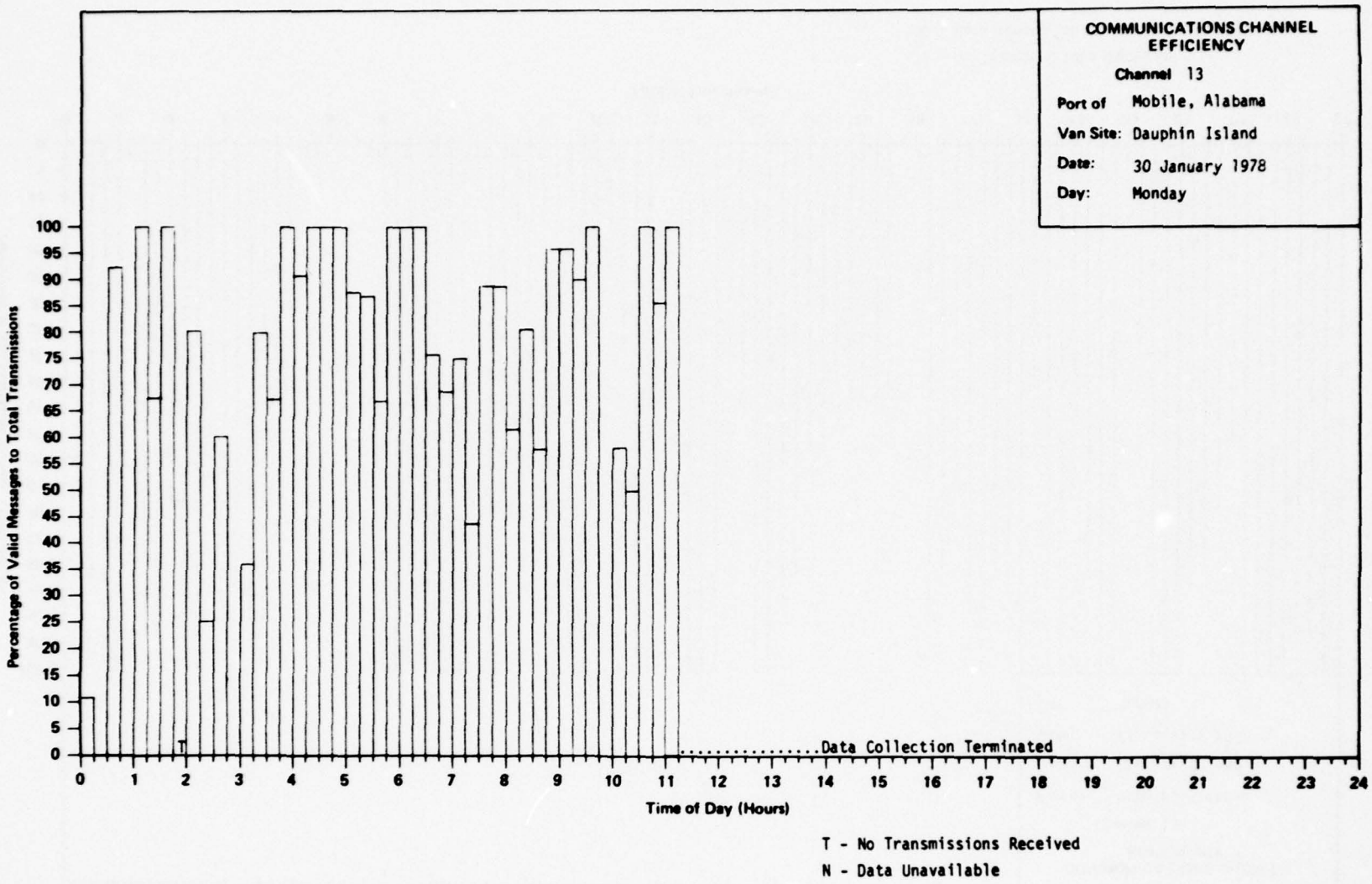
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 13
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 30 January 1978
Day: Monday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
Data Collection Terminated
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-43

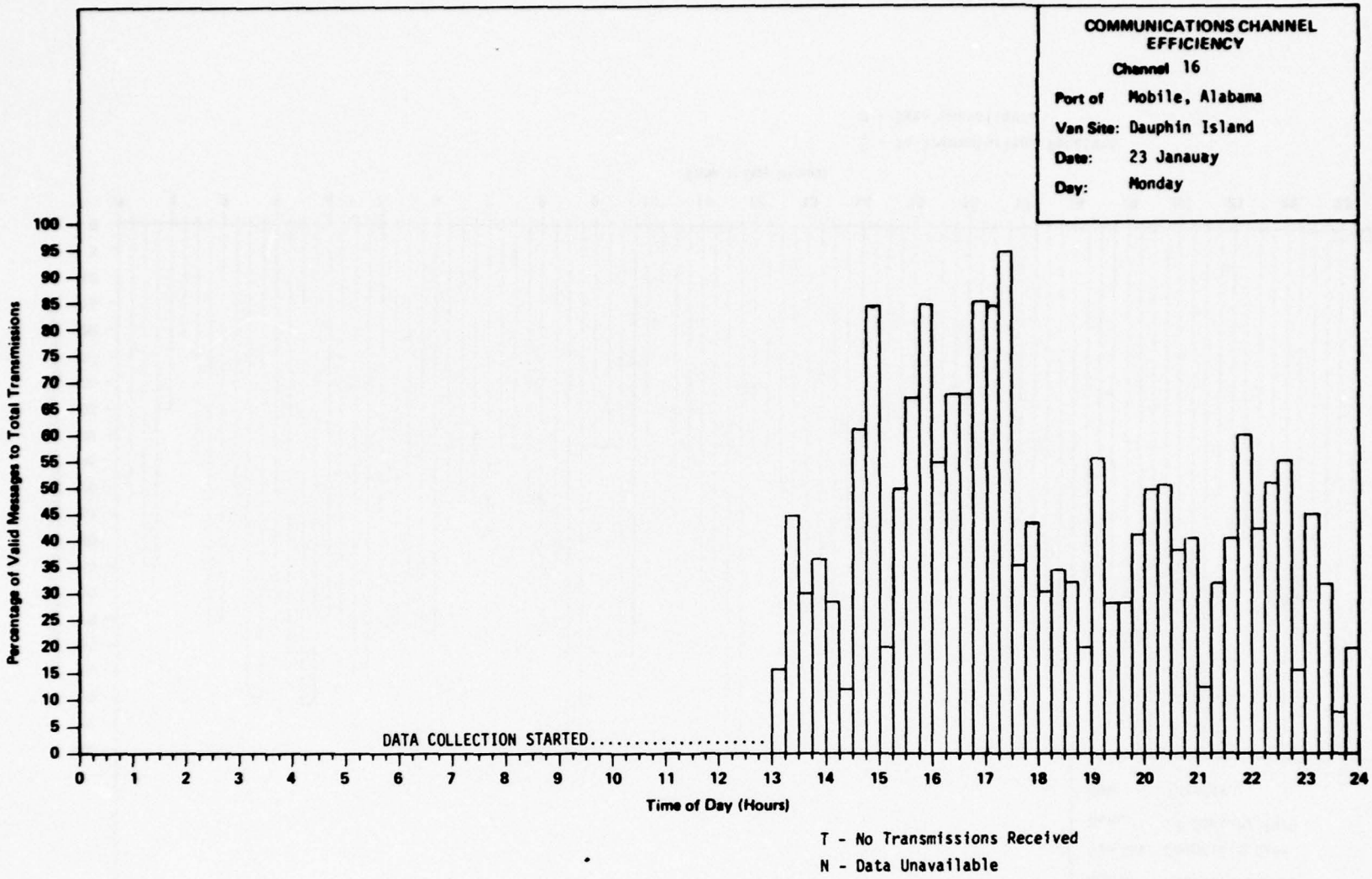
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 23 Janauay
Day: Monday
Percentage of Valid Messages to Total Transmissions
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
DATA COLLECTION STARTED.....
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-44

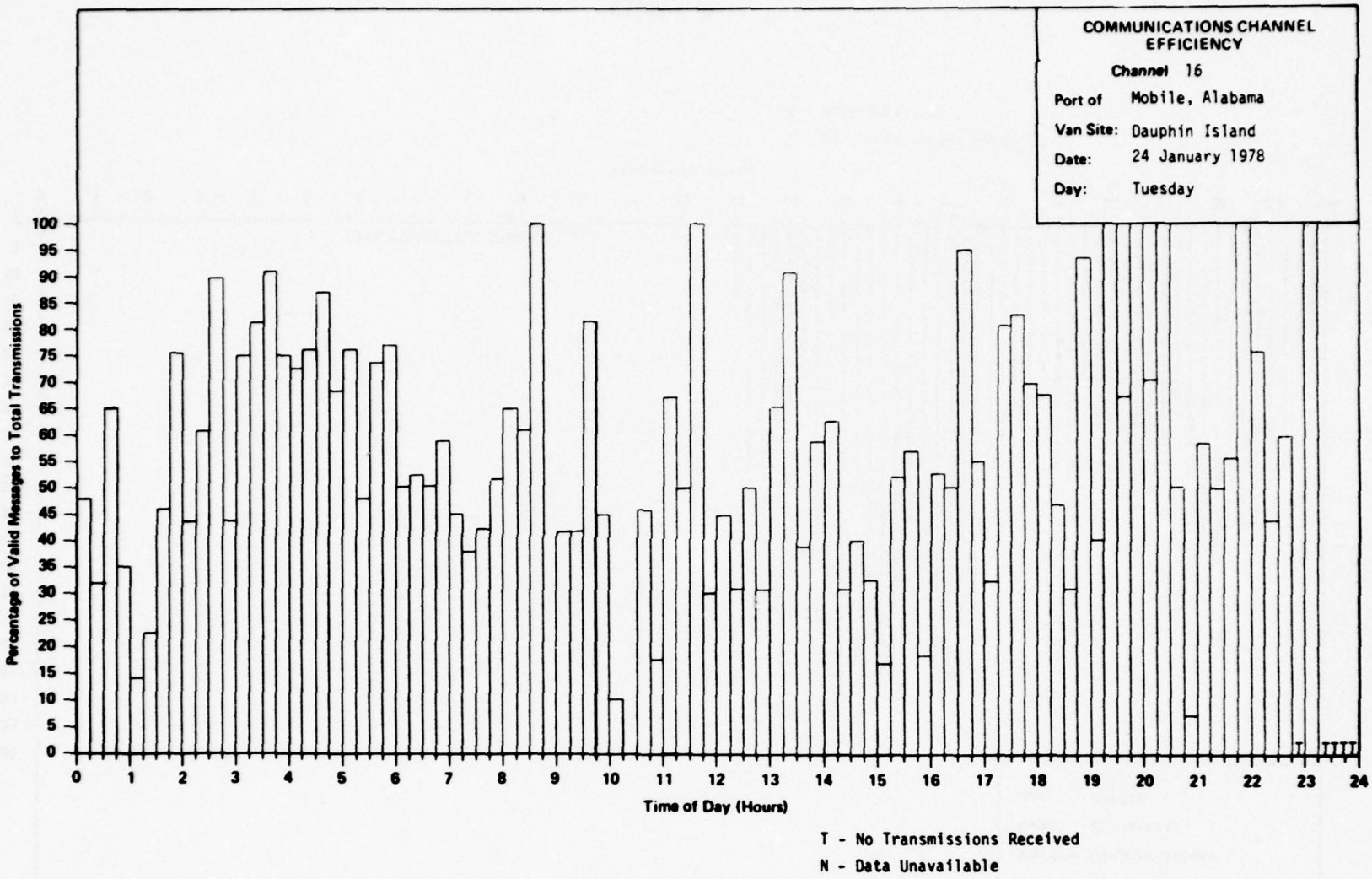
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 24 January 1978
Day: Tuesday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-45

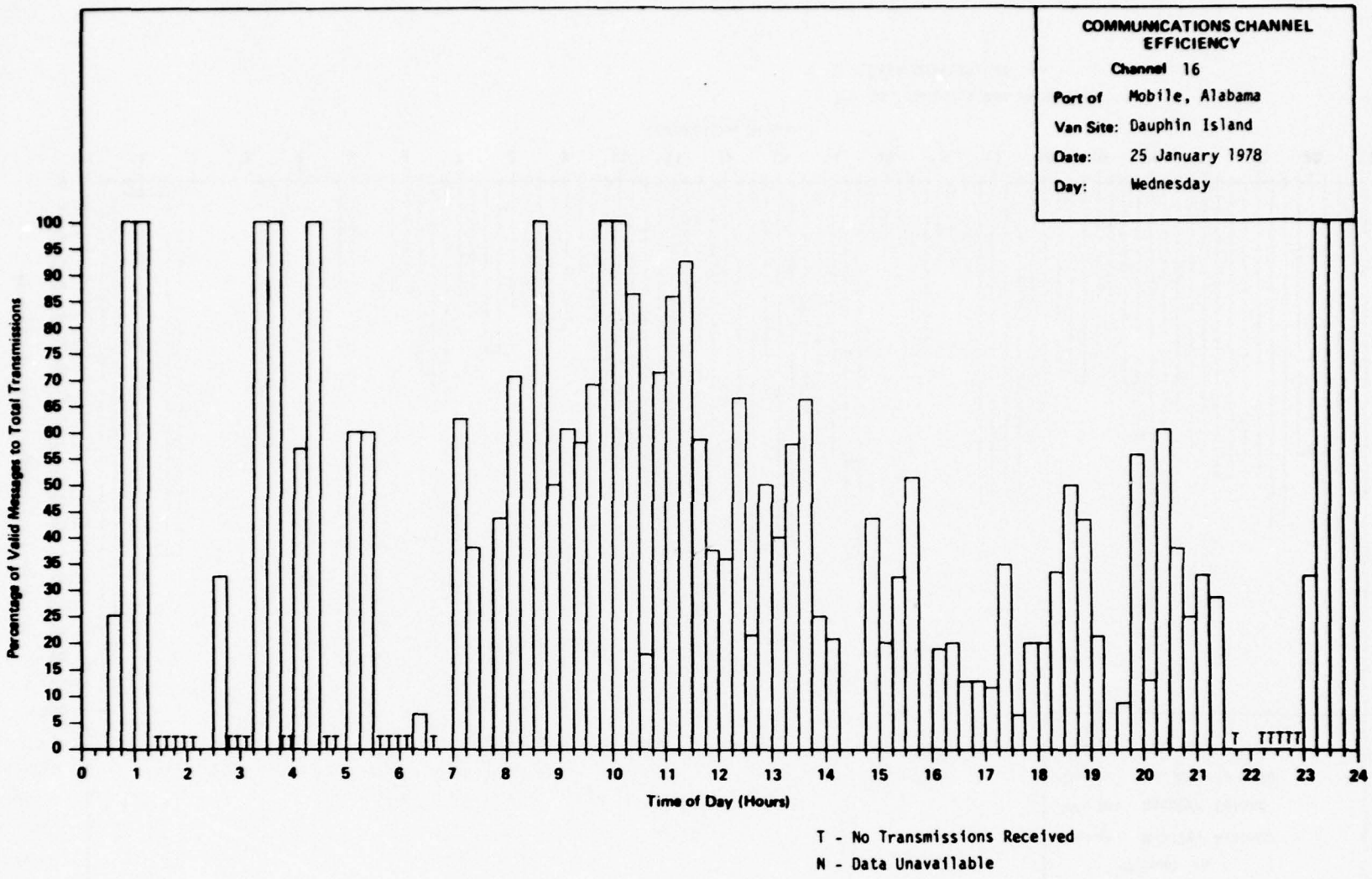
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 25 January 1978
Day: Wednesday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-46

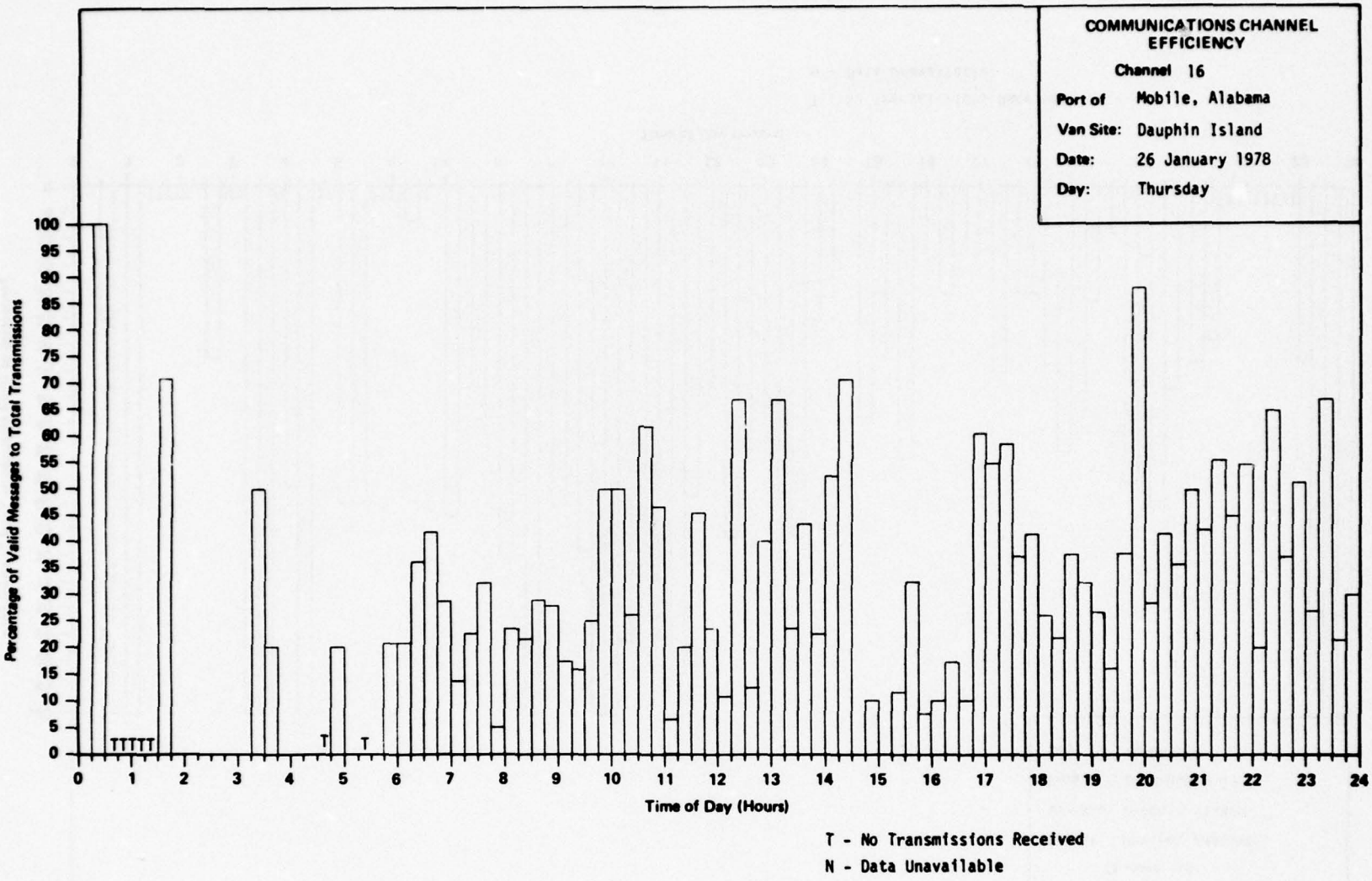
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 26 January 1978
Day: Thursday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-47

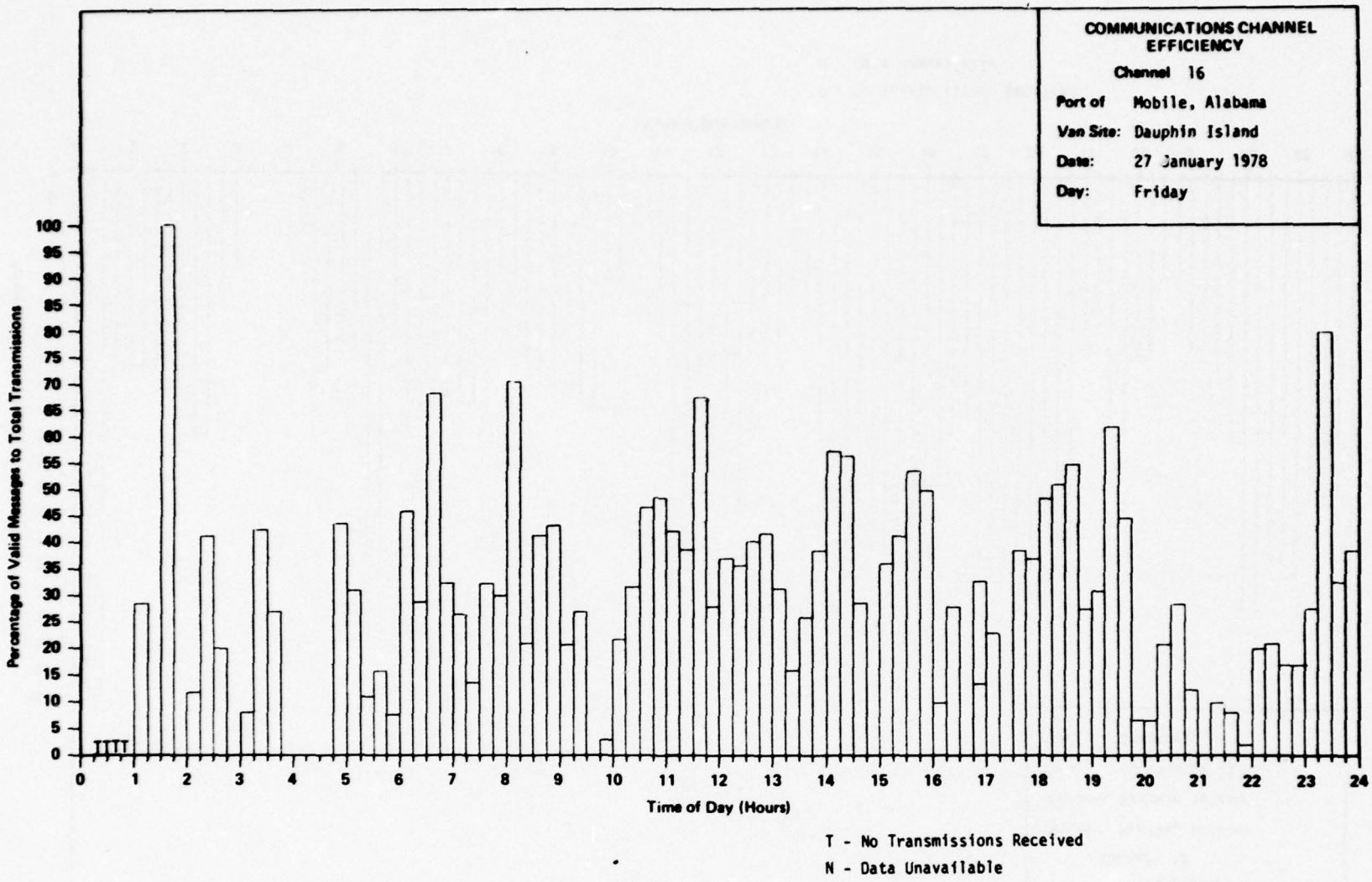
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 27 January 1978
Day: Friday
Percentage of Valid Messages to Total Transmissions
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-48

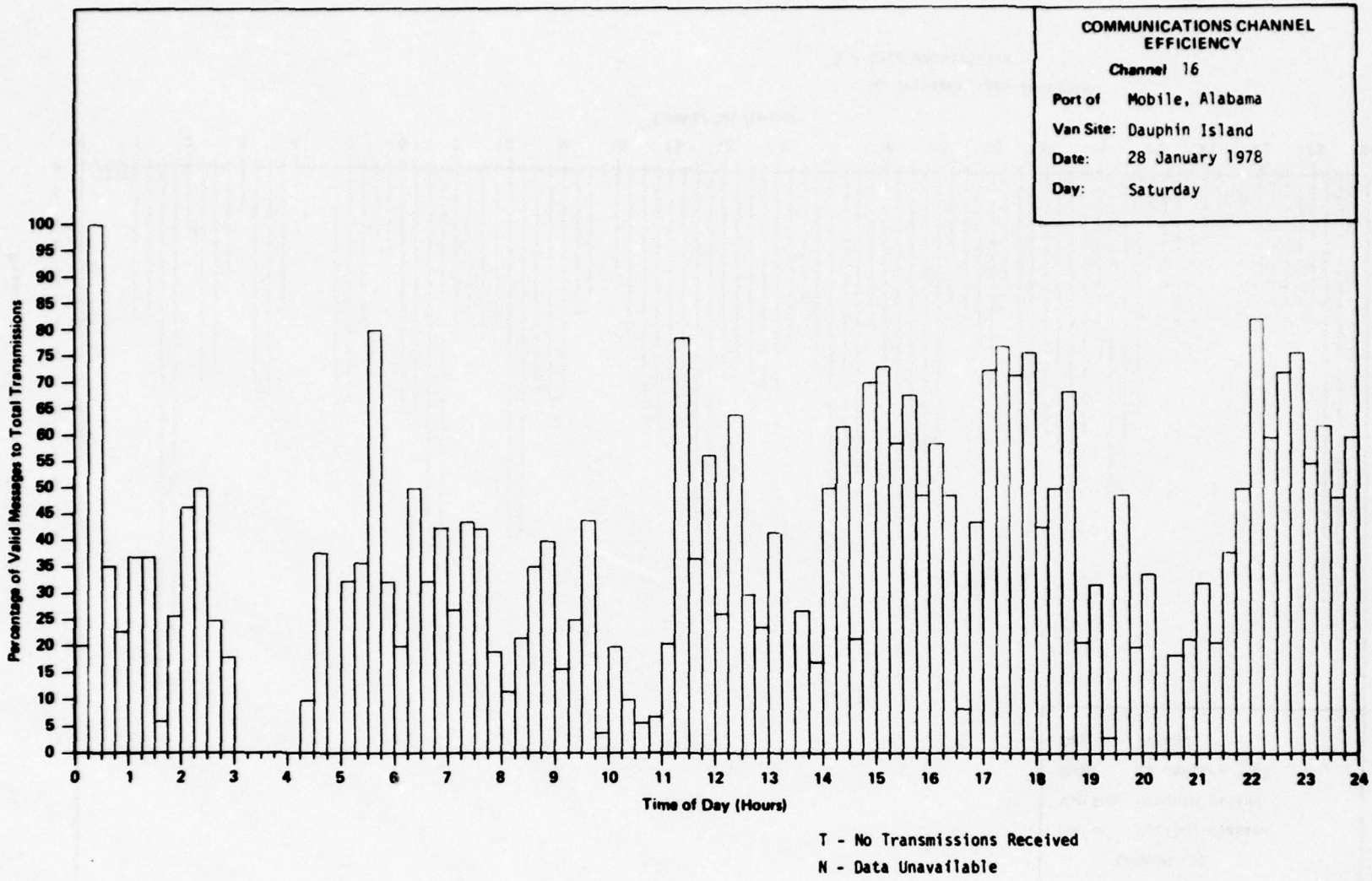
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 28 January 1978
Day: Saturday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-49

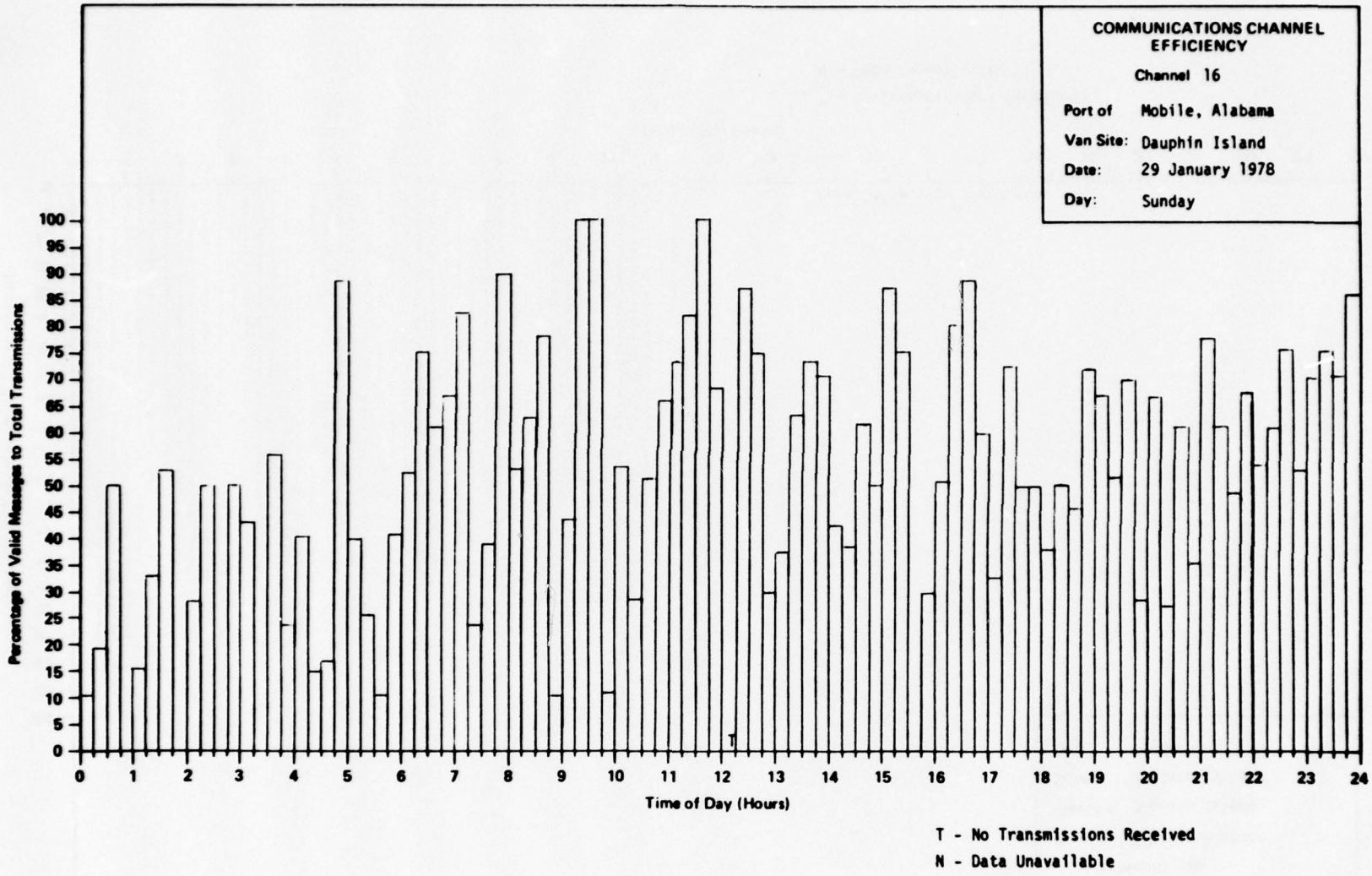
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 29 January 1978
Day: Sunday
Percentage of Valid Messages to Total Transmissions
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-50

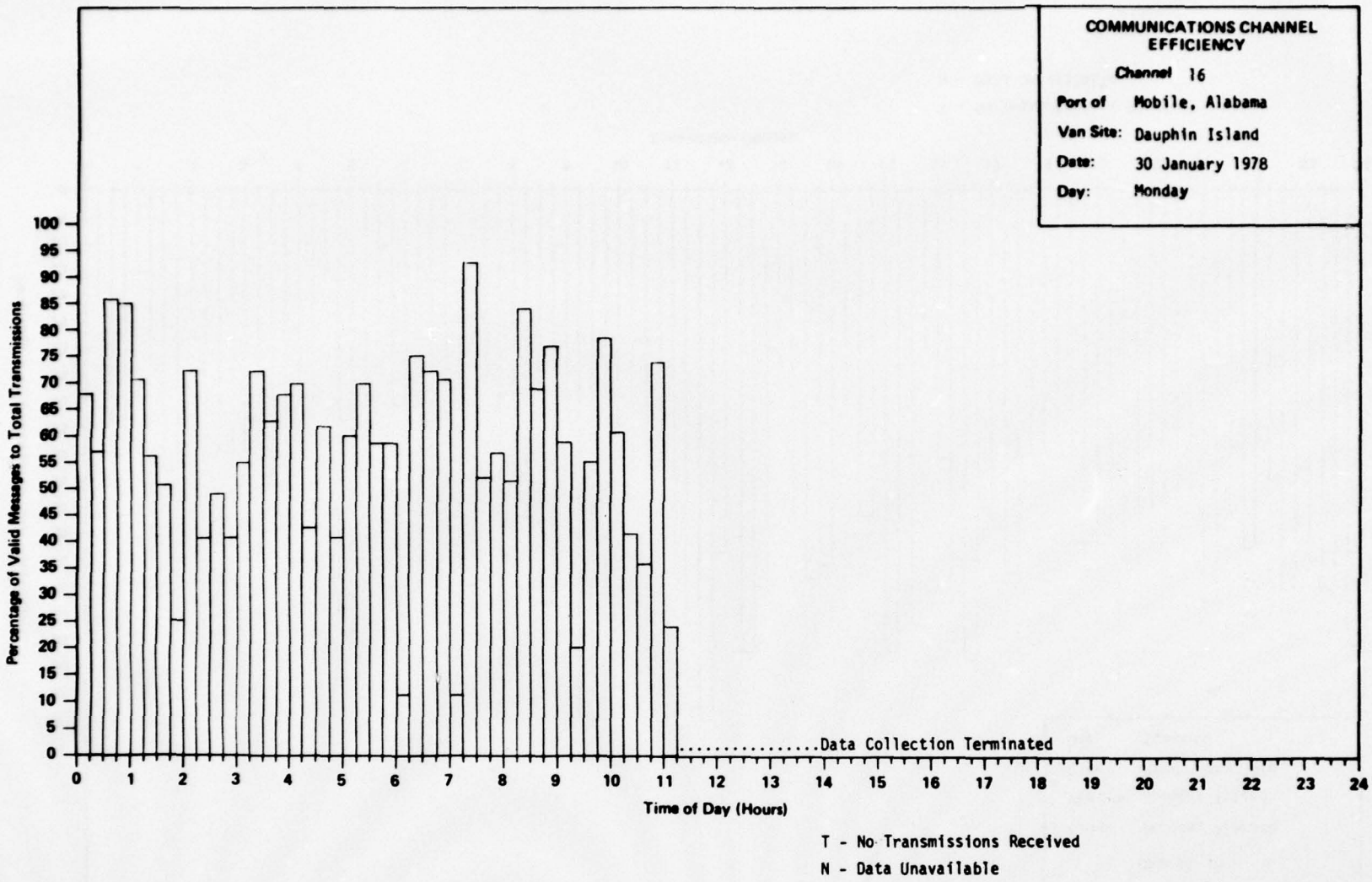
COMMUNICATIONS CHANNEL EFFICIENCY
Channel 16
Port of Mobile, Alabama
Van Site: Dauphin Island
Date: 30 January 1978
Day: Monday
Percentage of Valid Messages to Total Transmissions
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
.....Data Collection Terminated
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time of Day (Hours)
T - No Transmissions Received
N - Data Unavailable

FIGURE 2-51

MOBILE, ALABAMA VHF-FM CH 13 24-JAN-78 PAGE 1

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING	NUMBER OF XMSNS	MINUTES	PERCENT
15	29	0 54	3 62
30	15	0 20	1 34
45	32	1 08	7 18
100	15	0 16	1 04
115	13	0 27	1 80
130	16	0 14	0 96
145	2	0 20	1 36
200	0	0 00	0 00
215	2	0 03	0 18
230	1	0 00	0 02
245	1	0 01	0 03
300	1	0 01	0 03
315	1	0 01	0 03
330	2	0 03	0 18
345	8	0 68	4 54
400	45	2 57	17 16
415	78	4 09	27 26
430	30	1 01	6 71
445	4	0 39	2 62
500	46	3 01	20 09
515	25	1 90	12 68
530	61	4 86	32 41
545	20	1 77	11 81
600	10	0 41	2 72
615	26	1 12	7 48
630	22	1 31	8 77
645	13	0 69	4 60
700	24	2 33	15 52
715	52	6 46	43 09
730	29	0 54	3 58
745	20	0 69	4 60
800	22	2 13	14 20
815	17	1 14	7 59
830	10	1 00	6 67
845	5	0 14	0 96
900	11	0 30	2 03
915	12	0 56	3 76
930	17	0 70	4 64
945	2	0 17	1 10
1000	29	0 77	5 17
1015	52	0 62	4 17
1030	7	0 30	2 00
1045	18	0 74	4 93
1100	10	0 18	1 22
1115	6	0 40	2 68
1130	19	1 12	7 50
1145	0	0 00	0 00
1200	10	0 05	0 37

FIGURE 2-52

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING	NUMBER OF XMSNS:	MINUTES:	PERCENT
1215	4	0 03	0 20
1230	21	1 78	11 90
1245	5	0 46	3 04
1300	0	0 00	0 00
1315	1	0 04	0 23
1330	1	0 00	0 02
1345	52	1 43	9 51
1400	2	0 03	0 20
1415	9	0 13	0 89
1430	5	0 03	0 20
1445	1	0 01	0 03
1500	1	0 01	0 03
1515	3	0 02	0 13
1530	10	0 34	2 30
1545	4	0 06	0 39
1600	12	0 73	4 86
1615	13	1 10	7 36
1630	7	0 42	2 80
1645	4	0 19	1 28
1700	16	0 66	4 41
1715	3	0 02	0 13
1730	15	0 45	2 99
1745	6	0 27	1 79
1800	27	0 92	6 16
1815	18	1 10	7 33
1830	15	1 04	6 91
1845	4	0 15	1 02
1900	57	4 54	30 29
1915	31	2 91	19 41
1930	9	0 60	4 00
1945	12	0 66	4 39
2000	18	0 54	3 61
2015	8	0 80	5 37
2030	6	0 74	4 92
2045	5	0 21	1 43
2100	17	0 24	1 61
2115	48	6 32	42 12
2130	1	0 01	0 04
2145	3	0 04	0 28
2200	0	0 00	0 00
2215	6	0 35	2 34
2230	1	0 02	0 11
2245	3	0 05	0 33
2300	0	0 00	0 00
2315	6	0 55	3 66
2330	0	0 00	0 00
2345	0	0 00	0 00

FIGURE 2-52 (continued)

TOTAL NUMBER OF TRANSMISSIONS:	1380
AVE. NUM OF TRANSMISSIONS PER HOUR:	57.5
TOTAL TRANSMISSION TIME:	1.281 HOURS
AVERAGE LENGTH OF TRANSMISSION:	3.34 SEC.
PERCENT CHANNEL UTILIZATION:	5.34%

MESSAGE LENGTH HISTOGRAM

LENGTH OF XMSNS	NUMBER OF XMSNS	PERCENT
0.1 - 0.5 SEC.	391	28.33
0.5 - 1.0 SEC.	169	12.25
1.0 - 1.5 SEC.	105	7.61
1.5 - 2.0 SEC.	94	6.81
2.0 - 2.5 SEC.	82	5.94
2.5 - 3.0 SEC.	62	4.49
3.0 - 3.5 SEC.	45	3.26
3.5 - 4.0 SEC.	52	3.77
4.0 - 4.5 SEC.	52	3.77
4.5 - 5.0 SEC.	40	2.90
5.0 - 5.5 SEC.	34	2.46
5.5 - 6.0 SEC.	25	1.81
6.0 - 6.5 SEC.	28	2.03
6.5 - 7.0 SEC.	14	1.01
7.0 - 7.5 SEC.	18	1.30
7.5 - 8.0 SEC.	21	1.52
8.0 - 8.5 SEC.	13	0.94
8.5 - 9.0 SEC.	13	0.94
9.0 - 9.5 SEC.	14	1.01
9.5 - 10.0 SEC.	7	0.51
LONGER THAN 10 SEC. :	101	7.32

THERE WERE 319 XMSNS OF 00.1 AND 00.0 DURATION

FIGURE 2-52 (continued)

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING	NUMBER OF XMSNS	MINUTES	PERCENT
15	0	0 00	0 00
30	8	0 13	0 88
45	0	0 00	0 00
100	0	0 00	0 00
115	4	0 03	0 20
130	0	0 00	0 00
145	0	0 00	0 00
200	12	0 66	4 39
215	0	0 00	0 00
230	0	0 00	0 00
245	0	0 00	0 00
300	0	0 00	0 00
315	0	0 00	0 00
330	0	0 00	0 00
345	0	0 00	0 00
400	0	0 00	0 00
415	7	0 04	0 28
430	0	0 00	0 00
445	0	0 00	0 00
500	0	0 00	0 00
515	0	0 00	0 00
530	1	0 18	1 18
545	1	0 01	0 07
600	0	0 00	0 00
615	0	0 00	0 00
630	4	0 05	0 31
645	0	0 00	0 00
700	14	0 37	2 48
715	3	0 02	0 12
730	2	0 08	0 56
745	18	2 19	14 60
800	0	0 00	0 00
815	0	0 00	0 00
830	0	0 00	0 00
845	0	0 00	0 00
900	0	0 00	0 00
915	0	0 00	0 00
930	16	0 95	6 32
945	0	0 00	0 00
1000	48	2 71	18 06
1015	13	0 65	4 37
1030	0	0 00	0 00
1045	0	0 00	0 00
1100	0	0 00	0 00
1115	0	0 00	0 00
1130	14	0 89	5 91
1145	84	3 65	24 34
1200	4	0 40	2 70

FIGURE 2-53

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING:	NUMBER OF XMSNS:	MINUTES:	PERCENT:
1215	16	2.30	15.33
1230	37	3.74	24.94
1245	20	0.64	4.30
1300	15	2.21	14.71
1315	1	0.08	0.53
1330	54	3.34	22.24
1345	8	0.50	3.32
1400	0	0.00	0.00
1415	47	1.34	8.97
1430	9	0.25	1.67
1445	2	0.12	0.78
1500	6	0.04	0.27
1515	5	0.14	0.96
1530	16	0.08	0.56
1545	58	3.36	22.41
1600	0	0.00	0.00
1615	2	0.01	0.08
1630	0	0.00	0.00
1645	3	0.44	2.96
1700	0	0.00	0.00
1715	0	0.00	0.00
1730	33	1.42	9.44
1745	0	0.00	0.00
1800	2	0.03	0.20
1815	26	2.07	13.83
1830	17	1.02	6.82
1845	13	0.91	6.10
1900	32	3.45	23.03
1915	20	1.06	7.08
1930	45	4.06	27.06
1945	46	3.28	21.88
2000	57	4.03	26.86
2015	8	0.18	1.23
2030	12	1.15	7.70
2045	28	1.49	9.97
2100	0	0.00	0.00
2115	0	0.00	0.00
2130	0	0.00	0.00
2145	0	0.00	0.00
2200	0	0.00	0.00
2215	0	0.00	0.00
2230	0	0.00	0.00
2245	0	0.00	0.00
2300	0	0.00	0.00
2315	0	0.00	0.00
2330	0	0.00	0.00
2345	0	0.00	0.00

FIGURE 2-53 (continued)

TOTAL NUMBER OF TRANSMISSIONS: 891
AVE. NUM OF TRANSMISSIONS PER HOUR: 37.1
TOTAL TRANSMISSION TIME: 0.930 HOURS
AVERAGE LENGTH OF TRANSMISSION: 3.76 SEC
PERCENT CHANNEL UTILIZATION: 3.87%

MESSAGE LENGTH HISTOGRAM

LENGTH OF XMSNS	NUMBER OF XMSNS	PERCENT
0.1 - 0.5 SEC	138	15.49
0.5 - 1.0 SEC	108	12.12
1.0 - 1.5 SEC	81	9.09
1.5 - 2.0 SEC	80	8.98
2.0 - 2.5 SEC	54	6.06
2.5 - 3.0 SEC	58	6.51
3.0 - 3.5 SEC	56	6.29
3.5 - 4.0 SEC	47	5.27
4.0 - 4.5 SEC	46	5.16
4.5 - 5.0 SEC	25	2.81
5.0 - 5.5 SEC	31	3.48
5.5 - 6.0 SEC	18	2.02
6.0 - 6.5 SEC	19	2.13
6.5 - 7.0 SEC	12	1.35
7.0 - 7.5 SEC	6	0.67
7.5 - 8.0 SEC	13	1.46
8.0 - 8.5 SEC	9	1.01
8.5 - 9.0 SEC	10	1.12
9.0 - 9.5 SEC	6	0.67
9.5 - 10.0 SEC	4	0.45
LONGER THAN 10 SEC	70	7.86

THERE WERE 188 XMSNS OF 00.1 AND 00.0 DURATION

FIGURE 2-53 (continued)

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING:	NUMBER OF XMSNS:	MINUTES:	PERCENT:
15	0	0.00	0.00
30	0	0.00	0.00
45	0	0.00	0.00
100	0	0.00	0.00
115	0	0.00	0.00
130	0	0.00	0.00
145	0	0.00	0.00
200	0	0.00	0.00
215	0	0.00	0.00
230	0	0.00	0.00
245	0	0.00	0.00
300	1	0.01	0.09
315	0	0.00	0.00
330	0	0.00	0.00
345	0	0.00	0.00
400	1	0.01	0.06
415	0	0.00	0.00
430	0	0.00	0.00
445	0	0.00	0.00
500	0	0.00	0.00
515	0	0.00	0.00
530	0	0.00	0.00
545	0	0.00	0.00
600	1	0.02	0.17
615	2	0.10	0.70
630	1	0.01	0.07
645	0	0.00	0.00
700	0	0.00	0.00
715	0	0.00	0.00
730	0	0.00	0.00
745	1	0.00	0.02
800	0	0.00	0.00
815	0	0.00	0.00
830	0	0.00	0.00
845	0	0.00	0.00
900	7	0.28	1.89
915	4	0.24	1.60
930	0	0.00	0.00
945	0	0.00	0.00
1000	0	0.00	0.00
1015	0	0.00	0.00
1030	0	0.00	0.00
1045	0	0.00	0.00
1100	0	0.00	0.00
1115	0	0.00	0.00
1130	0	0.00	0.00
1145	0	0.00	0.00
1200	0	0.00	0.00

FIGURE 2-54

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING	NUMBER OF XMSNS	MINUTES	PERCENT
1215	0	0 00	0 00
1230	0	0 00	0 00
1245	0	0 00	0 00
1300	0	0 00	0 00
1315	0	0 00	0 00
1330	0	0 00	0 00
1345	0	0 00	0 00
1400	0	0 00	0 00
1415	0	0 00	0 00
1430	0	0 00	0 00
1445	0	0 00	0 00
1500	0	0 00	0 00
1515	1	0 01	0 06
1530	0	0 00	0 00
1545	0	0 00	0 00
1600	0	0 00	0 00
1615	0	0 00	0 00
1630	0	0 00	0 00
1645	2	0 06	0 41
1700	0	0 00	0 00
1715	0	0 00	0 00
1730	0	0 00	0 00
1745	0	0 00	0 00
1800	0	0 00	0 00
1815	0	0 00	0 00
1830	0	0 00	0 00
1845	0	0 00	0 00
1900	7	0 27	1 80
1915	10	0 77	4 78
1930	9	0 40	2 66
1945	4	0 12	0 82
2000	0	0 00	0 00
2015	0	0 00	0 00
2030	0	0 00	0 00
2045	0	0 00	0 00
2100	0	0 00	0 00
2115	0	0 00	0 00
2130	0	0 00	0 00
2145	0	0 00	0 00
2200	0	0 00	0 00
2215	0	0 00	0 00
2230	0	0 00	0 00
2245	0	0 00	0 00
2300	1	0 01	0 04
2315	1	0 00	0 02
2330	0	0 00	0 00
2345	0	0 00	0 00

FIGURE 2-54 (continued)

TOTAL NUMBER OF TRANSMISSIONS:	53
AVE. NUM OF TRANSMISSIONS PER HOUR:	2.2
TOTAL TRANSMISSION TIME:	0.038 HOURS
AVERAGE LENGTH OF TRANSMISSION:	2.57 SEC.
PERCENT CHANNEL UTILIZATION:	0.16%

MESSAGE LENGTH HISTOGRAM

LENGTH OF XMSNS	NUMBER OF XMSNS	PERCENT
0.1 - 0.5 SEC.	8	15.09
0.5 - 1.0 SEC.	8	15.09
1.0 - 1.5 SEC.	8	15.09
1.5 - 2.0 SEC.	5	9.43
2.0 - 2.5 SEC.	3	5.66
2.5 - 3.0 SEC.	4	7.55
3.0 - 3.5 SEC.	3	5.66
3.5 - 4.0 SEC.	5	9.43
4.0 - 4.5 SEC.	3	5.66
4.5 - 5.0 SEC.	0	0.00
5.0 - 5.5 SEC.	0	0.00
5.5 - 6.0 SEC.	1	1.89
6.0 - 6.5 SEC.	0	0.00
6.5 - 7.0 SEC.	2	3.77
7.0 - 7.5 SEC.	0	0.00
7.5 - 8.0 SEC.	2	3.77
8.0 - 8.5 SEC.	0	0.00
8.5 - 9.0 SEC.	0	0.00
9.0 - 9.5 SEC.	0	0.00
9.5 - 10.0 SEC.	0	0.00
LONGER THAN 10 SEC.	1	1.89

THERE WERE 9 XMSNS OF 00.1 AND 00.0 DURATION

FIGURE 2-54 (continued)

MOBILE, ALABAMA VHF-FM CH 16 26-JAN-78 PAGE 1

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING	NUMBER OF XMSNS	MINUTES	PERCENT
15	3	0 18	1 21
30	2	0 12	0 81
45	0	0 00	0 00
100	0	0 00	0 00
115	0	0 00	0 00
130	0	0 00	0 00
145	8	1 36	9 06
200	2	0 03	0 18
215	3	0 01	0 09
230	0	0 00	0 00
245	2	0 03	0 19
300	1	0 02	0 12
315	2	0 02	0 17
330	8	0 14	0 96
345	7	0 38	2 54
400	7	0 09	0 62
415	9	0 28	1 89
430	1	0 00	0 02
445	0	0 00	0 00
500	15	0 30	1 99
515	4	0 03	0 18
530	0	0 00	0 00
545	2	0 01	0 06
600	25	1 06	7 09
615	29	0 67	4 44
630	11	0 97	6 46
645	46	2 16	14 38
700	19	0 79	5 27
715	36	1 44	9 62
730	31	1 85	12 33
745	51	2 92	19 50
800	17	0 76	5 10
815	32	1 18	7 86
830	31	0 94	6 26
845	24	1 12	7 48
900	31	1 52	10 17
915	64	2 08	13 87
930	40	0 88	5 84
945	32	0 95	6 37
1000	43	1 76	11 71
1015	16	0 58	3 89
1030	43	1 35	8 98
1045	74	3 06	20 43
1100	25	0 41	2 77
1115	19	0 47	3 14
1130	26	0 98	6 54
1145	11	0 54	3 62
1200	23	0 67	4 47

FIGURE 2-55

TRANSMISSION TIME HISTOGRAM

PERIOD ENDING:	NUMBER OF XMSNS:	MINUTES:	PERCENT:
1215	17	0.96	6.42
1230	9	0.60	4.03
1245	35	0.52	3.47
1300	9	0.14	0.94
1315	10	0.56	3.72
1330	34	0.87	5.78
1345	10	0.25	1.68
1400	28	0.87	5.79
1415	31	1.17	7.81
1430	8	0.39	2.59
1445	29	0.47	3.17
1500	3	0.10	0.66
1515	11	0.22	1.44
1530	8	0.32	2.17
1545	34	1.67	11.12
1600	16	0.65	4.37
1615	31	1.46	9.73
1630	19	0.45	3.03
1645	20	0.29	1.93
1700	30	2.11	14.06
1715	53	1.81	12.07
1730	22	0.75	5.00
1745	36	2.16	14.43
1800	41	2.41	16.07
1815	37	1.94	12.91
1830	35	1.59	10.59
1845	16	0.51	3.39
1900	38	1.31	8.71
1915	54	1.12	7.47
1930	39	2.03	13.53
1945	60	1.78	11.90
2000	15	0.72	4.79
2015	24	0.98	6.53
2030	18	0.68	4.56
2045	46	1.29	8.63
2100	33	1.58	10.54
2115	29	1.47	9.83
2130	29	1.22	8.16
2145	19	1.26	8.43
2200	10	0.57	3.79
2215	17	0.85	5.70
2230	13	0.62	4.17
2245	32	1.84	12.26
2300	21	0.97	6.44
2315	28	0.95	6.33
2330	12	0.92	6.11
2345	43	2.29	15.30
2400	25	0.56	3.76

FIGURE 2-55 (continued)

TOTAL NUMBER OF TRANSMISSIONS: 2107
AVE. NUM OF TRANSMISSIONS PER HOUR: 87.8
TOTAL TRANSMISSION TIME: 1.407 HOURS
AVERAGE LENGTH OF TRANSMISSION: 2.40 SEC.
PERCENT CHANNEL UTILIZATION: 5.86%

MESSAGE LENGTH HISTOGRAM

LENGTH OF XMSNS	NUMBER OF XMSNS	PERCENT
0.1 - 0.5 SEC.	597	28.33
0.5 - 1.0 SEC.	263	12.48
1.0 - 1.5 SEC.	184	8.73
1.5 - 2.0 SEC.	157	7.45
2.0 - 2.5 SEC.	158	7.50
2.5 - 3.0 SEC.	154	7.31
3.0 - 3.5 SEC.	131	6.22
3.5 - 4.0 SEC.	114	5.41
4.0 - 4.5 SEC.	65	3.08
4.5 - 5.0 SEC.	46	2.18
5.0 - 5.5 SEC.	45	2.14
5.5 - 6.0 SEC.	30	1.42
6.0 - 6.5 SEC.	25	1.19
6.5 - 7.0 SEC.	23	1.09
7.0 - 7.5 SEC.	14	0.66
7.5 - 8.0 SEC.	23	1.09
8.0 - 8.5 SEC.	12	0.57
8.5 - 9.0 SEC.	7	0.33
9.0 - 9.5 SEC.	7	0.33
9.5 - 10.0 SEC.	9	0.43
LONGER THAN 10 SEC.	43	2.04

THERE WERE 406 XMSNS OF 00.1 AND 00.0 DURATION

FIGURE 2-55 (continued)

APPENDIX A

GEOGRAPHICAL DESCRIPTION OF MOBILE BAY

A.1 BACKGROUND

The following description of the Mobile Bay, Alabama, area (Figure A-1) was excerpted from the United States Coast Pilot, Volume 5, for 1976 and is included here to make this report more complete and readily understandable.

A.2 MOBILE BAY

Mobile Bay, 40 miles west of Pensacola and 90 miles northeast of South Pass, Mississippi River, is the approach to the city of Mobile and to the Alabama and Tombigbee Rivers. The bay has depths of seven to twelve feet outside the dredged channels. The entrance is three miles wide between Mobile Point on the east and Pelican Point on the west, but most vessels will prefer to follow the dredged channel rather than chance passage between the breakers and shoals that extend four miles south on both sides.

Mobile, 28 miles north of the bay entrance, is one of the largest and most important seaports on the Gulf of Mexico. A fully equipped ocean terminal, excellent transportation facilities, large shipyards, and all kinds of marine supplies can be obtained at Mobile. Principal foreign exports are marine supplies, paper products, lumber, wood pulp, flour, aluminum, chemicals, grain, soybeans, coal and bunker oil, iron and steel products, and fertilizer. The principal foreign imports are bauxite, mahogany, crude rubber, sugar, newsprint, seafood, rubber, pig iron, ores, molasses, automobiles, fishmeals, frozen foods, and chemicals. The coastwise trade consists mainly of petroleum products, lumber, shell, iron and steel products, chemicals, and food products. Inland waterway transportation for handling iron and steel products, ore, sugar, and coal serve the Warrior, Tombigbee, and Alabama River systems with connections to the Mississippi River.

A.3 CHANNELS

The main ship channel, the entrance or bar channel, leads from the Gulf between Southeast Shoal and Mobile Point on the east and Sand Island and West Bank on the west. Federal project depth is 42 feet over the bar. In addition to the dredged channel across the bar, the natural channel has depths of 18 feet or more. Inside the bar, depths in the channel increase to as much as 56 feet, with at least a width of 500 yards between the shoals which rise abruptly from deep water. The wreck of the MAGNOLIA, on the east side of the channel 0.7 mile southwest of Mobile Point, is marked by a lighted buoy; one mast extends about 20 feet above the water. The channel is marked by lighted buoys, buoys, and a lighted range on Mobile Point. The rear range light is on the same structure and below Mobile Point Light. Storm warning signals are displayed.

From west, boats drawing up to six feet can enter Mobile Bay via Pelican Passage and Pelican Bay, only with local knowledge, owing to the shifting

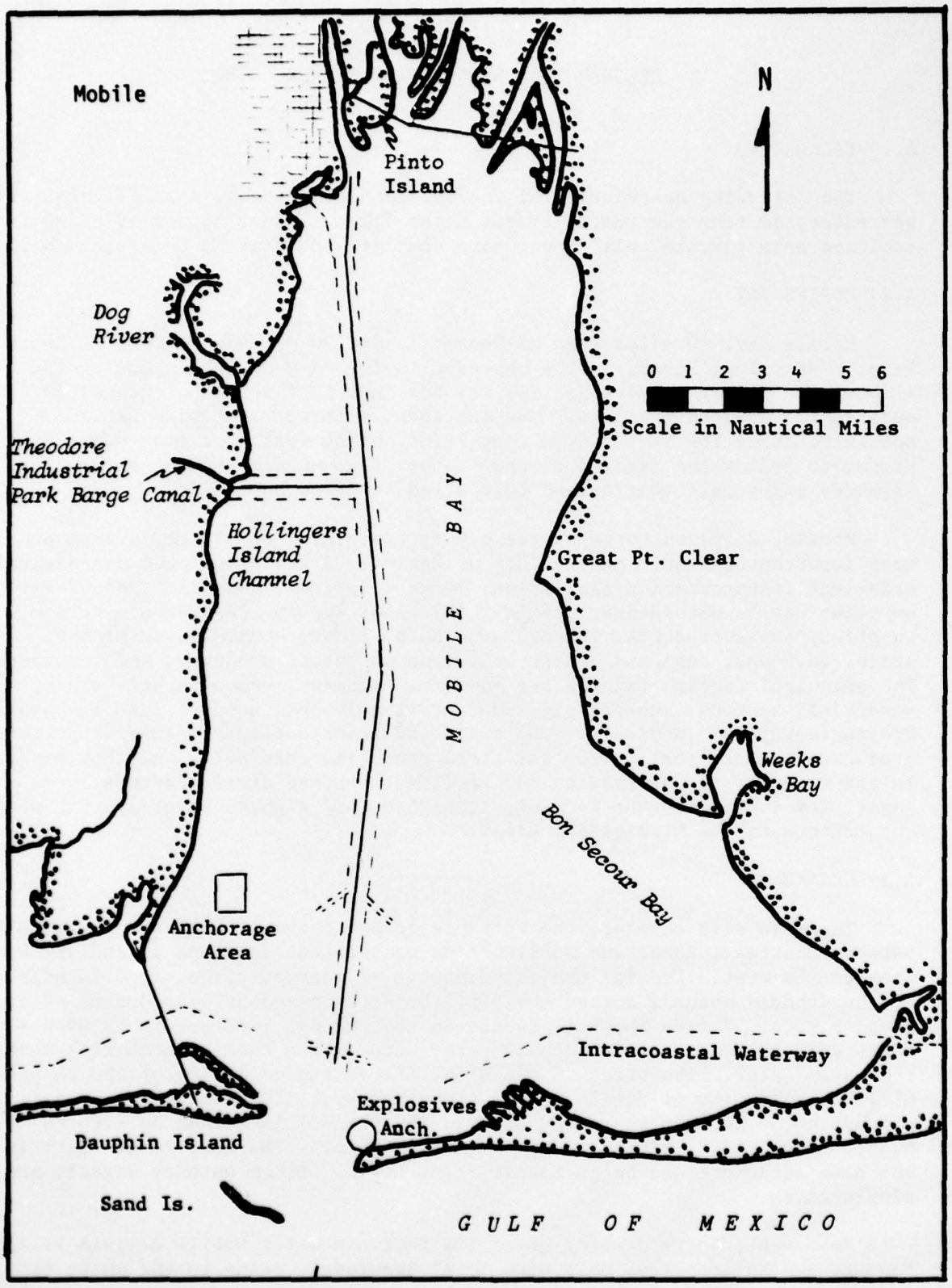

FIGURE A-1: MOBILE BAY, ALABAMA

character of the bottom. The channel passes between the shoal southeast of Pelican Passage and Dauphin Island, thence east into Pelican Bay. The best water can be found by passing to the south of Dauphin Island Spit before shaping a course north into Mobile Bay. The channel is marked by two daybeacons, a buoy, and a light.

From east, only about three feet can be taken across Southeast Shoal around Mobile Point. It is necessary to pass very close to shore; the passage should only be attempted under most favorable weather conditions and with local knowledge. The channels shift frequently.

Mobile Bay Channel extends from the lower anchorage off Fort Morgan through Mobile Bay to Mobile River. Federal project depth is 40 feet to and in a turning basin off Magazine Point at the head of Mobile Ship Channel. Although the channel is subject to shoaling, the project is generally maintained. The channel is well marked with lighted ranges, lights, and lighted and unlighted buoys.

From a point 25.7 miles north of the bay entrance, Arlington Channel, a dredged channel, leads west-northwest from Mobile Bay Channel to a turning basin in the west part of Garrows Bend. In May 1975, the controlling depths were 16 feet (22 feet at midchannel) in the channel and 15 to 20 feet in the turning basin. The channel is marked by a lighted range, lights, and daybeacons. A Coast Guard station is at the west end of the channel.

Garrows Bend Channel, a dredged channel, leads northeast from the turning basin to a causeway between McDuffie Island and the mainland. In 1962, the controlling depth in the channel was seven feet.

Mobile River Channel extends from Mobile Bay Channel for four miles to the bridge at St. Louis Point. Federal project depths are 40 feet from the mouth of the river to and inside Mobile Turning Basin, thence 40 feet to St. Louis Point, and thence 25 feet to the mouth of and in Chickasaw Creek for about two miles to just below Shell Bayou entrance.

Threemile Creek leads west from Mobile River Channel just south of Magazine Point. About 0.6 mile above the creek entrance, Industrial Canal leads south for about one mile. Depths of about 9 feet can be carried in the creek to the canal, thence 12 feet in the canal. Chemicals, seafood, cement, gypsum, sand and gravel, lumber, chemical plants, and oil terminals are on the canal. The large bulk material-handling plant of the Alabama State Docks, with over 1,600 feet of berthing space in 40 feet, is on the south side of the entrance to Threemile Creek. (See Section B.3.)

The old ship channel around the south end of Pinto Island, which leads to Tensaw River, had a controlling depth of eight feet in 1972. The channel is marked by daybeacons.

Hollingers Island Channel leads west from a point in Mobile Bay Channel, 18 miles north of the entrance, to a turning basin and pier on the west shore of Mobile Bay. In July 1972, the reported midchannel depth was ten feet in the channel with nine feet alongside the pier. The channel is well marked by

lights and daybeacons. The pier has 600 feet of usable berthing space on both the north and south sides and is used for the receipt of oil by barges.

Theodore Industrial Park Barge Canal, also privately dredged, leads west from the turning basin at the west end of Hollingers Island Channel for about 1.4 miles to a turning basin with a wharf on its north side; in 1969, the reported depth was 12 feet in the channel and in 1972, a depth of 9 feet was reported alongside the wharf. The 226-foot wharf has 1,134 feet of usable berthing space with dolphins and is used for the receipt of coal, shell, and iron by barge. Overhead power and telephone cables with a least clearance of 50 feet cross the channel about one mile west of Hollingers Island Channel turning basin.

A.4 INTRACOASTAL WATERWAY

Bon Secour Bay, extending about 14 miles east of Mobile Bay entrance, has depths of seven to ten feet. The bay is the route of the ICW (Intracoastal Waterway) which crosses Mobile Bay Channel at a point 2.6 miles north of the bay entrance.

The 22.5-mile route of the waterway is through a well-marked dredged channel, except inside the entrance to Mobile Bay from the Gulf where general depths are greater than 12 feet.

From Mobile Bay, the waterway goes through Pass aux Herons to the open water of Mississippi Sound, which has general depths greater than 12 feet until up to Marianne Channel, at the west end of the sound.

Dauphin Island Causeway (State Route 163) highway bridge over Pass aux Herons has a lift span with clearance of 19 feet down and 79 feet up. In 1967, a vessel reported striking a submerged object in the channel at Mile 127.3E, about 0.4 mile west of the bridge.

The current velocity is 1.3 knots through Pass aux Herons.

A.5 ANCHORAGES

Vessels should anchor in the Mobile Bay Anchorage, south of and between the safety fairways. The best anchorages in the lower bay for deep-draft vessels are found north and northwest of Mobile Point in depths ranging from 20 to 45 feet with excellent holding ground. This anchorage is secure, but during a norther a short heavy choppy sea is raised which may be uncomfortable for small vessels. A circular explosives anchorage is just north of Mobile Point. An anchorage for unmanned and other nondescript vessels has been designated near Cedar Point.

Vessels with permission of the harbormaster may anchor temporarily in four designated places abreast the city (of Mobile) east of the dredged channel, but must maintain position parallel with the channel; nor more than one vessel can be anchored abreast.

Vessels are not permitted to anchor in the Bar Channel, Mobile Bay Channel, or Mobile River Channel.

In emergencies, light-draft vessels can anchor in Mobile River above Cochrane (U.S. Route 90) highway bridge with permission of the harbormaster.

Small boats sometimes anchor north and east of Fort Morgan in Navy Cove. Several piles and other obstructions are in this locality.

A.6 DANGERS

Shoals extend about 4.5 miles south and west of Mobile Bay entrance. Southeast Shoal, covered 3 feet, is on the east side of the Bar Channel, and Sand Island Shoal, covered 1 foot, and West Bank, covered 3 feet, are on the west side.

The wreck of the Civil War vessel TECUMSEH is north of Mobile Point Light. The wreck is marked by a buoy with orange and white bands. The vessel is reported to be in an unstable condition, and ammunition and powder aboard the wreck could be detonated if the vessel shifts. Mariners are cautioned not to anchor in the area of the buoy and to reduce speed producing as little wake as possible when transiting Mobile channel between Buoys 15 and 17.

A nearly continuous spoil bank extends along either side of the bay channel from just inside Mobile Bay entrance to the mouth of Mobile River. Through these spoil banks are several charted openings for passage to various points in Mobile Bay.

Fish havens, consisting of concrete pipe, lie within a 3.5-mile-square area which extends offshore from 2.7 miles to 6.2 miles east of Mobile Point.

Fish havens, consisting of old automobile bodies lashed together, scrap iron, and concrete, have been or may be established on the bottom along the 10-fathom curve off the Alabama coast. While they are not dangerous and are reported to have a minimum depth of 10 fathoms over them, vessels are advised not to anchor in their vicinity.

A.7 TIDES AND CURRENTS

The tides are chiefly diurnal and the rise and fall is very small, averaging 1.2 and 1.5 feet at Mobile. During the winter, northers may depress the water surface as much as 1.5 feet below mean low water, while hurricanes have been known to raise the level as much as 11.5 feet.

In this area strong winds have considerable effect in modifying the times and velocities of the current; in using the tables, allowance should be made for such effects.

The tidal current near the outer end of the Main Ship Channel is rotary. Both the flood and ebb currents set somewhat to the left of the channel direction before reaching their strength, and to the right of the channel direction

after the times of strength. During three days of current observations at this location, there was an outflow of 0.5 knot average velocity combined with the tidal current.

It has been reported that velocities of 8 to 10 knots have been observed in the Bar Channel and Mobile Bay Channel on the runoff of the ebb after protracted periods of strong southerly winds. Low-powered and deep-draft vessels should be guided by the advice of the pilots under these conditions.

A.8 WEATHER

Mobile is located at the head of Mobile Bay and about 30 miles from the Gulf of Mexico. Its weather is influenced to a considerable extent by the Gulf.

The summers are consistently warm, but maximum temperatures are seldom as high as they are at inland stations. Normally, in summer, the day begins with a minimum in the low seventies and the temperature rises rapidly before noon to the high eighties or low nineties where it is checked by onset of the sea breeze. On the rare occasions where northerly winds prevail throughout the day, the maxima may reach the high nineties or go slightly above 100°F (37.7°C).

Winter weather is usually mild except for occasional invasions of cold air that last about three days. January is the coldest month in the year. An average winter will have less than 20 days with below-freezing minima, and the lowest reading will be about 23°F (-5.0°C). However, unusual winters may produce much lower readings.

The normal annual rainfall is among the highest in the United States. It is fairly evenly distributed throughout the year with a slight maximum at the height of the summer thunderstorm season and a slight minimum during the late fall. Rainfall is usually of the shower type, and long periods of continuous rain are rare.

Frontal thunderstorms may occur in any month of the year and airmass storms are frequent in summer. July and August will average a thunderstorm every other day. The summer months are usually not too violent and seldom produce hail.

While the Mobile area has not had a destructive hurricane since 1926, this seems to be due to chance than to location. Past records show that this area is subject to hurricanes from the West Indies, as well as to those from the western Caribbean and the southwestern Gulf of Mexico.

Southerly breezes bring considerable fog during the early spring; northerly breezes clear it away.

Severe northers, which blow occasionally during the winter, lower the water in the bay so as to interfere with the deeper draft vessels bound through the dredged channel. During heavy southerly gales, it is not always safe for vessels of over 25-foot draft to attempt to cross the bar.

The National Weather Service maintains offices in Mobile.

A.9 PILOTAGE

Pilotage is compulsory for all foreign vessels and U.S. vessels under register in foreign trade. Pilotage is optional for coastwise vessels that have on board a pilot licensed by the Federal government.

The two pilot boats ALABAMA and MOBILE PILOT are fast-water taxis and are based at Fort Gaines. They are equipped with radar, VHF-FM, and low-frequency radiotelephones. The pilots monitor VHF-FM Channels 13 and 16 continuously from the pilot station or boats. In addition, all pilots carry portable radiotelephones which operate on VHF-FM Channels 12 and 13, and some of the sets also operate on VHF-FM Channels 6 and 16. The pilot boats, tugs, and bridges are interconnected on the VHF-FM intraport radiotelephone system with the harbormaster's office.

The pilot boats, which have gray hulls and white superstructures with the word PILOT on the front of the deckhouse, meet vessels in the vicinity of Mobile Entrance Lighted Whistle Buoy 1.

Pilots can be ordered by telegraph, by radio, by radiotelephone through the Mobile Marine Operator (WLO), telephone, or through the ship's agents. The pilots request that a reasonably correct estimated time of arrival at the bar be given and should be corrected within two hours of arrival time.

Vessels drawing up to 40 feet are taken in day or night.

A.10 TOWAGE

Diesel-powered tugs and oceangoing tugs up to 3,600 horsepower are available at Mobile.

A.11 COAST GUARD

The Captain of the Port maintains an office at the Mobile Coast Guard Base at the southwest end of Garrows Bend. A marine inspection and vessel documentation office is in the Federal Building.

A.12 HARBOR REGULATIONS

The Alabama State Docks Department has jurisdiction over the bay, harbor, and that part of all the tributary streams in which the tide ebbs and flows, and extends to the outer shoal five miles south-southwest of Fort Morgan at the entrance to the harbor. It has supervision over harbor pilotage, State wharves and shipping, as well as authority in all matters relating to the arrival, departure, loading, and discharging of all vessels at State wharves. Most routine functions are administered through the harbormaster.

The harbormaster controls all of the waterway traffic in the area, assigns berths, and enforces the rules and regulations of the port. Ships are normally taken to their berths by the port pilots, but any subsequent shifting

or redocking of vessels in the harbor is done by the harbormaster and his deputies. The harbormaster's office is in the Administration Building at the State Docks and is connected by the intraport VHF-FM Channels 12 and 16 radiotelephone system with all pilot boats, tugs, and the Cochrane and Dauphin Island bridges.

A.13 SPEED LIMIT

No vessel, except launches, shall exceed six miles per hour in the inner harbor between Mobile Channel Light 40 to and including Chickasaw Creek, and shall take all possible precautions to prevent disturbance of vessels berthed at marginal wharves.

APPENDIX B

THE PORT OF MOBILE

B.1 WHARVES

The Port of Mobile (Figure B-1) has more than 100 piers and wharves, most of which are located on both sides of the Mobile River between the mouth and the confluence with Chickasaw Creek about four miles above the mouth. Facilities are also on Theodore Industrial Park Barge Canal, Arlington Channel, Threemile Creek, Industrial Canal, Chickasaw Creek, Hog Bayou, and Black Bayou.

The facilities on the west side of the Mobile River are generally for handling cargo, while the facilities on the east side are service and industry related. Only the deep-draft facilities are described. The alongside depths of the facilities described are reported. All deep-draft facilities have rail and direct highway connections and almost all have water and electrical shore power connections.

General cargo at the port is usually handled by ship's tackle; special handling equipment, if available, is mentioned in the description of the particular facility.

In the port area, the Alabama State Docks Department and private companies operate warehouses having a total of more than 834,000 square feet of dry storage space and more than 568,000 cubic feet of cold storage space. Warehouse and transit shed space totals 2.5-million square feet. About 26 acres of open storage space is available.

B.2 FACILITIES ON GARROWS BEND CHANNEL, EAST SIDE

McDuffie Terminals: south end of McDuffie Island; berthing for vessels up to 850 feet long; loading rate 4,000 tons per hour, unloading rate 3,000 tons per hour; bucket unloader and conveyor system; 31 acres open storage; receipt and shipment of bulk coal; barge staging area adjacent to terminal; owned by the State of Alabama, operated by Alabama State Docks Department.

B.3 FACILITIES ON MOBILE RIVER, WEST SIDE

Gulf, Mobile, and Ohio Railroad Company, Oil Pier: west end of south side 240 feet long, 15 feet alongside; east end of south side, 235 feet long, 15 feet alongside; north side, 495 feet long, 35 feet alongside; deck heights, 9 feet; receipt of petroleum products, chemicals, and petrochemicals by barges; receipt of molasses and liquid livestock feed; owned by Gulf, Mobile, and Ohio Railroad Company, and operated by Triangle Refineries, Incorporated; Shell Oil Company; and Pro Rico Industries, Incorporated.

Texaco, Mobile Terminal Pier: about 300 yards north of Gulf, Mobile, and Ohio Railroad Company, Oil Pier; south side, 630 feet long, 15 feet alongside; north side, 630 feet long, 34 feet alongside; deck heights, 12 feet; receipt

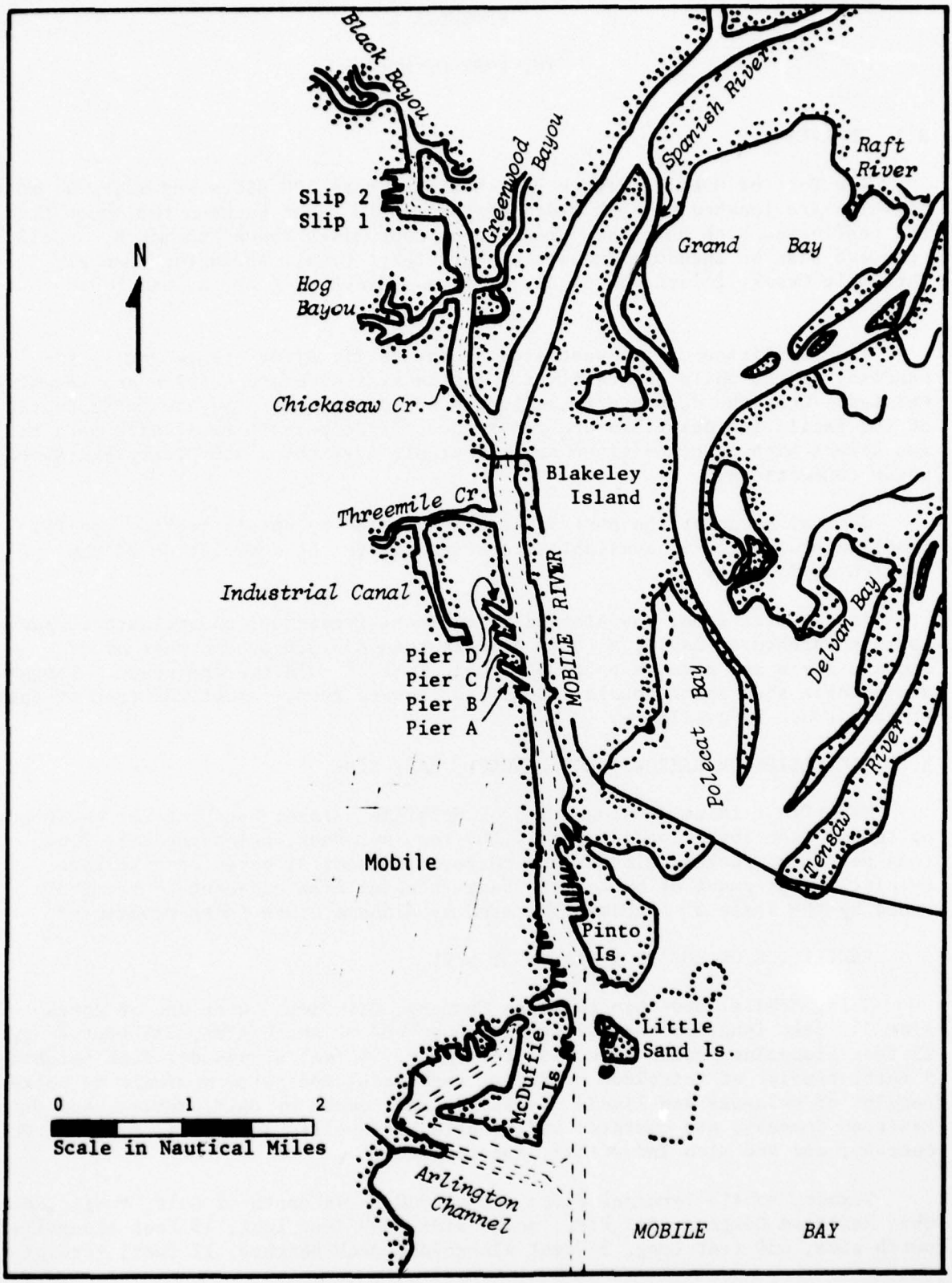

FIGURE B-1: PORT OF MOBILE

and shipment of petroleum products; bunkering vessels, and loading barges for bunkering vessels at berth; owned and operated by Texaco, Incorporated.

Marine Bulk Pier: about 400 yards north of Gulf, Mobile, and Ohio Railroad Company, Oil Pier: south side, 255 feet long, 12 feet alongside; north side, 1,000 feet long, 42 feet alongside; deck heights, 10 feet; unloading tower with cantilevered boom and bucket system, belt-conveyor system serves rail and barge loading hoppers, 150-ton traveling hopper for self-unloading vessels; receipt of iron, manganese, ferromanganese, and fluorspar ores; receipt and shipment of shale; bunkering vessels; owned by U.S. Steel Corporation, and operated by Marine Bulk Handling Corporation.

B.4 ALABAMA STATE DOCKS

Alabama State Docks, Berths 2 through 8, Piers A through D, and Bulk Material Handling Plant: owned by the State of Alabama, operated by the Alabama State Docks Department. These docks form a modern port terminal, open to all users alike. The facilities include many concrete wharves, fireproof shipside transit sheds and covered warehouse space, grain and meal elevators, a cotton compress and warehouse, bonded general cargo warehousing, terminal rail connections, cold storage and quick-freeze plants, and numerous auxiliary facilities. The largest crane at the terminal is a 100-ton cargo handling crane mounted on rubber tires for mobility and flexibility. Floating cranes up to 80-ton capacity are also available, as are smaller cranes, lift trucks, trailers, and conveyors.

Berths 2, 3, 4, and 5: 2,131-foot marginal wharf; 36 feet alongside; deck height, 11 feet; 135,000 square feet covered storage; 7 acres of open storage; 50-ton gantry crane; receipt and shipment of steel, heavy-lift cargo, and general and containerized cargo.

Berths 6, 7, and 8: east face 1,080 feet long; corner face, 160 feet long; north face, 495 feet long; 36 feet alongside; deck heights, 11 feet; 210,000 square feet covered storage; receipt and shipment of general cargo.

Pier A, South Wharf: south side, 550 feet long, 37 feet alongside, deck height, 11 feet; head of pier, 330 feet long, 36 feet alongside, deck heights, 6 feet; 68,000 square feet covered storage, 2.5 acres open storage; pipelines to storage, conveyor belt system; receipt of bagged fishmeal; receipt and shipment of bulk liquids.

Pier A, North Wharf: north side, 1,520 feet long, 38 feet alongside, deck height, 11 feet; head of slip, 457 feet long, 36 feet alongside, deck height, 6 feet; 102,000 square feet covered storage; cotton compress and warehouse; receipt and shipment of general cargo; shipment of cotton.

Pier B: about 300 yards north of Pier A; south side, 1,540 feet long; head of pier, 650 feet long; north side, 1,625 feet long; 36 feet alongside; deck heights, 11 feet; 372,000 square feet covered storage; 1.25 acres of open storage; pipelines for bunkers; receipt and shipment of general cargo; receipt of bunker C and marine fuel; bunkering vessels, and loading barges for bunkering vessels at berth.

Pier C: about 600 yards north of Pier A; south side, 1,540 feet long; head of pier, 810 feet long; north side, 1,015 feet long; 36 feet alongside; deck heights, 11 feet; 221,000 square feet covered storage; 5.75 acres of open storage; 75-ton lift; receipt and shipment of general cargo; bunkering vessels.

Pier D, South Grain Elevator Wharf, Berths 2 and 3: about 0.5 mile north of Pier A; inner portion of south side of Pier D; 830 feet with dolphins; 36 to 40 feet alongside; deck height, 11 feet; 1.25-million-bushel grain elevator; 15,000 bushel-per-hour unloading rate; 40,000 bushel-per-hour loading rate; receipt of grain by barge; shipment of grain by vessel.

Pier D, South Meal Elevator Wharf, Berth 1: outer portion of south side of Pier D, in line with and contiguous with South Grain Elevator Wharf to the southeast; 645 feet with dolphins, 36 feet alongside; 200 feet of barge berthing space with dolphins, 14 feet alongside; deck height, 11 feet; 18,000-long-ton capacity meal storage elevator; 250 long tons per hour unloading rate; 200 long tons per hour loading rate; receipt of soybeam meal by barge; shipment of soybean meal by vessel.

Pier D, North Wharf: 538-foot face, 36 feet alongside; deck height, 11 feet; 38,000 square feet covered storage, 1.75 acres of open storage; 450,000 cubic feet of cold storage cooler and freezer space; receipt and shipment of general cargo; bunkering vessels.

Bulk Material Handling Plant Wharf: on south side of Threemile Creek; 1,612-foot marginal wharf; 40 feet alongside; deck height, 9.5 feet; covered warehouse space for 12,000 tons of fishmeal; two 100,000-ton capacity bauxite storage buildings; open storage space for 200,000 tons of ore; one stationary unloading tower, capacity 1,200 tons per hour; four traveling unloading towers, capacities up to 700 tons per hour; a rotary car dumper, two-belt-conveyor systems and hatch trimmers; receipt and shipment of dry bulk commodities including coal, coke, fishmeal, bauxite, gravel, manganese ore, iron ore, and pig iron.

Hess Ship Dock: 74-foot offshore wharf, 290 feet with dolphins; 40 feet alongside; deck height, 12 feet; shipment of crude oil; receipt and shipment of petroleum products; owned and operated by Hess Oil and Chemical Division, Amerada Hess Corporation.

Gulf Oil Company - U.S., Wharf: 100-foot offshore wharf, 280 feet with dolphins; 38 feet alongside; deck height, 8 feet; fueling small vessels; receipt of petroleum products; owned by Gulf Oil Company-U.S.; operated by Citronelle Mobile Gathering System.

B.5 FACILITIES ON MOBILE RIVER, EAST SIDE

Chevron Asphalt Company Wharf: 105-foot offshore wharf, 240 feet with dolphins; 30 feet alongside; deck height, 7 feet; receipt and shipment of asphalt; owned and operated by Chevron Asphalt Company, Incorporated.

Reichold Chemicals Wharf: 60-foot offshore wharf, 360 feet with dolphins; 26 feet alongside; deck height, 10 feet; receipt and shipment of petroleum products, chemicals, and petrochemicals; owned and operated by Reichold Chemicals, Incorporated.

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